

A REPORT TO

**THE HONORABLE JAMES S. GILMORE, III, GOVERNOR
AND
CHAIRS OF THE
HOUSE COMMITTEES ON APPROPRIATIONS AND
CONSERVATION AND NATURAL RESOURCES
AND THE
SENATE COMMITTEES ON FINANCE AND
AGRICULTURE, CONSERVATION AND NATURAL RESOURCES**

TOTAL MAXIMUM DAILY LOAD PROGRAM

A Ten Year Implementation Plan



**Department of Environmental Quality
Department of Conservation and Recreation
Department of Mines, Minerals and Energy
Department of Health**

**COMMONWEALTH OF VIRGINIA
November 1, 2000**

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MEMORANDUM

TO: The Honorable James S. Gilmore, III, Governor
The Honorable Members of the General Assembly

FROM: Dennis H. Treacy

SUBJECT: IMPLEMENTATION PLAN FOR TOTAL MAXIMUM DAILY LOADS

As directed by the General Assembly, the Department of Environmental Quality, in cooperation with the Departments of Conservation and Recreation, Mines, Minerals and Energy, and Health, has prepared the enclosed report describing how we propose to implement the Total Maximum Daily Load program in Virginia over the next ten years. To assist agency staff during the development of this report, a TMDL Stakeholders Advisory Committee was formed. The committee members provided invaluable advice and reviews to agency staff. We are very grateful for their guidance and support.

The Total Maximum Daily Load program is mandated by the federal Clean Water Act, and Virginia's Water Quality Monitoring, Information and Restoration Act. It is designed to determine the total amounts of pollutants from all sources that a particular stream segment can receive and still achieve water quality standards. The TMDL program represents a significant expansion in the way water quality is managed, with a change in the focus of pollution control programs from primarily point source controls to encompass non-point sources as well. With the assistance of the Advisory Committee, DEQ and the other agencies have developed a plan to ensure full participation of all stakeholders in assessing what the potential sources of pollution are and determining what options for achieving the allowable TMDL will be most effective.

The fiscal impact of developing TMDLs in Virginia has been estimated on a biennial basis through 2010. The total cost of developing the TMDL mathematical models and accompanying implementation plans over the next ten years is estimated at \$59.3 million. To offset this expense, the state agencies currently have a general fund allocation of \$1.5 million, and projected federal funds of \$16.7 million for this ten-year period. This leaves a projected deficit of \$41 million through 2010.

The projected costs given above are to develop the TMDL models and plans for pollution reduction measures only. These figures do not include the costs for full implementation of the clean-up measures, such as the installation of Best Management Practices or upgrades of wastewater treatment plants. While these implementation costs are very difficult to estimate at this stage, our preliminary work indicates they could eventually top \$500 million over the next ten to 15 years.

If, after reviewing the report, you have any questions or desire additional information, please do not hesitate to contact me.

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Executive Summary

This report is prepared in response to Item 415.F.1 of the 2000 Appropriations Act, that directs DEQ to develop a comprehensive plan for implementation of the Total Maximum Daily Load (TMDL) program through 2010.

Authorization and Mandates for TMDL Development

§303(d) of the 1972 Clean Water Act requires the states to identify waters not in compliance with water quality standards, to generate a list of the impaired waters, and to develop TMDLs for the waters on the §303(d) list. In July, 1992, EPA promulgated regulations, 40 CFR §130.7, for §303(d) of the Clean Water Act.

In 1997, the Virginia General Assembly enacted the Water Quality Monitoring, Information, and Restoration Act, §62.1-44.19:4 through 19:8 of the Code of Virginia. This statute directs DEQ to generate a list of impaired waters, and to develop TMDLs and Implementation Plans for these waters. In 1999, EPA settled a lawsuit by agreeing to a Consent Decree detailing requirements for TMDL development in Virginia. If Virginia does not comply with this schedule, the decree mandates EPA to complete the TMDLs.

The Clean Water Act and the current §303(d) regulations do not contain requirements for TMDL Implementation Plans. However, EPA's recently revised 303(d) regulations require Implementation Plans to be developed. The new regulation takes effect in November, 2001.

What is a TMDL (Total Maximum Daily Load)?

A TMDL is a special study that identifies all significant sources of pollution, the pollutant contribution from each source, and the pollutant reductions needed from each source to attain and maintain water quality standards. TMDLs are pollutant specific. If a water is impaired by more than one pollutant, a TMDL must be developed for each pollutant. TMDLs can be expressed mathematically by the following equation:

$$\text{TMDL} = ? \text{ WLA} + ? \text{ LA} + \text{MOS}$$

Where: ? WLA = sum of the point source pollutant loads.

 ? LA = sum of the nonpoint source pollutant loads.

 MOS = margin of safety to account for uncertainties in the data.

Major Steps in TMDL Process

1. The first step in the TMDL process is listing the water as impaired on the 303(d) list. This is done by a comparative analysis of existing water quality data to the relevant water quality standard. If known, the cause, source and extent of the impairment(s) are identified in this process. Listing of waters for TMDL development is an integrated process involving monitoring, water quality standards, and Virginia Pollution Discharge Elimination System (VPDES) permits.
2. The second step in the process is the prioritization of impaired waters for TMDL development. Prioritization is currently being based largely on the availability of data needed for the TMDL. Most of the impaired waters with adequate data for accurate TMDL development have been used to meet the submittal schedules for 2000 and 2002. Prioritization of impaired waters for TMDL development for future years is based on severity of impairment, presence of endangered species, public interest, and efficiency in public participation.
3. Next in the sequence is the selection of a contractor and awarding of the contract for TMDL development.
4. After awarding the contract, the data acquisition phase of the TMDL begins. The listing of a waterbody as impaired is usually based on data from a single ambient chemical and/or

biological monitoring station. Therefore, water quality variations and stream flow for much of the impaired watershed is unknown. DEQ, the contractor, and TMDL team, conduct extensive monitoring and stream flow measurements of the watershed to obtain the data needed for the TMDL development.

5. The public participation process starts shortly after the contract is awarded. A public notice is placed in the Virginia Register and local newspaper(s) announcing the start of TMDL development. Generally, each TMDL has three public notices and meetings during the development process. Staff from the participating agencies attend stakeholder and focus group meetings upon request.
6. After completion of the public participation process, DEQ submits the completed TMDL to EPA for approval.
7. TMDL is presented to the State Water Control Board for adoption after EPA approval.
8. TMDL is incorporated into watershed Water Quality Management Plan.
9. The participating agencies start development of the Implementation Plan. The Implementation Plan will go through a similar public participation process as the TMDL, with adoption by the State Water Control Board. Contractors will be used and there will be emphasis on focus group meetings along with the public meetings in the development process of the Implementation Plans. Implementation plans will be incorporated into the watershed Water Quality Management Plan. EPA's new TMDL regulations currently scheduled to become effective on November 1, 2001, will require development of the TMDL Implementation Plan as part of the TMDL. See Section Six for additional discussion of this issue.
10. Implementation of the TMDL will be conducted through a variety of mechanisms and programs. VPDES permits must be in compliance with the TMDLs. Also, a variety of other tools will be used including state and local laws and regulations, as well as voluntary based actions.

TMDLs set the stage for the implementation of voluntary and existing regulatory reduction measures to reduce the pollutant loads for the attainment of water quality standards.

Impaired Waters and TMDL Schedule

DEQ developed the 1998 303(d) TMDL list as part of the biennial assessment of all chemical and biological data. EPA approved the waters that were on the list submitted by DEQ, but found the list incomplete, and added waters. Shown below in Table ES-1 are the number of waters identified as impaired, the number of waters identified for TMDL action and the estimated number of TMDLs.

Table ES-1
Impaired Waters for TMDL Action and Number of TMDLs
Due by 2010

	Number of Waters Identified as Impaired	Number of Waters Identified for TMDL Action	Estimated Number of TMDLs
DEQ Waters	247	247	295
DEQ Shellfish Waters	285	260	260
EPA Additions	71	18	18
Consent Decree Additions	200	75	75
Totals	803	600	648*

* 35 TMDL Contracts Awarded

In 1998, the American Canoe Association and the American Littoral Society filed a complaint against EPA for failure to comply with the provisions of §303(d) of the Clean Water Act in Virginia. As a result, EPA signed a Consent Decree with the plaintiffs in 1999 that contains Virginia's TMDL development schedule through year 2010. Also, under the Consent Decree, EPA agrees to develop TMDLs on the impaired waters to meet the schedule if Virginia fails to do so.

As shown below in Table ES-2, the number of impaired waters scheduled for TMDL development increases dramatically in the next three bienniums. The number increases from 12 in 2000 to 30 in 2002, 74 in 2004, and 213 in 2006. With the extensive stakeholder participation process, data assembly, technical analysis, and modeling, it takes 6 to 9 months to develop a TMDL for an impaired water. If the TMDL development for the 213 impaired waters due on May 1, 2006, are started in that biennium, calendar years 2004 and 2005, this would mean a TMDL would have to be completed about every other work day to meet the goal. The only way Virginia will be able to meet these accelerating requirements of the Consent Decree is to move the TMDL development starting dates forward to spread the workload more evenly over the next 5 years. Additionally, TMDL input data will have to be gathered or expanded on most of the TMDLs developed in the future.

Table ES-2
Total Consent Decree TMDL Schedule

Submittal Dates	EPA Action Dates	Consent Decree (Current Schedule for Impaired Waters)	Credit Limit for Waters Removed from List
5/1/99	5/1/00	1	0
5/1/00	5/1/01	12	2
5/1/02	5/1/03	30	6
5/1/04	5/1/05	74	11
5/1/06	5/1/07	213	13
5/1/08	5/1/09	127	14
5/1/10	5/1/11	179	14
TOTAL		636	60

Virginia needs to develop 648 TMDLs on 600 impaired waters. Some waters are impaired for more than one pollutant and will need multiple TMDLs. This includes the 295 TMDLs for waters shown in **Appendix C**, the 260 shellfish waters identified in DEQ's 1998 303(d) List, 18 waters from EPA's additions to Virginia's 303(d) List, and 75 impaired waters expected to be added to the 2002 303(d) List. This number of impaired waters most likely will change in the future based on changes in water quality standards, EPA listing guidance, de-listings, and changes in water quality conditions.

Currently, contracts have been awarded for the development of 35 TMDLs. EPA has approved two of these TMDLs and twelve others are under review by EPA. These TMDLs meet the 1999 and 2000 Consent Decree schedules. The other TMDLs currently under contract are being developed to meet the 2002 schedule. This leaves 613 TMDLs still to be developed by 2010.

Participating Agencies

The DEQ is the lead agency in the TMDL process. The WQMIRA (§62.1-44.19:4 et seq.) directs DEQ to generate a list of impaired waters, develop TMDLs for these waters, and develop Implementation Plans to meet the TMDL objectives. DEQ administers the TMDL process including the public participation component, and formally submits the TMDLs to EPA for approval. Once EPA approves the TMDL, it must also be approved by the Virginia State Water Control Board.

DCR and DMME have signed Memoranda of Understanding with DEQ agreeing to a cooperative effort in the TMDL and Implementation Plan development process. Specifically, DCR agreed to assume responsibility for the nonpoint source component of all TMDLs with the exception of mineral extractions. The DMME agreed to administer the mineral extraction component of the TMDL process and participate in the public participation process. The Virginia Department of Health has agreed to participate in a cooperative effort in the development of TMDLs for impaired shellfish waters.

TMDL and Implementation Plan Costs and Funding

DEQ estimates 613 TMDLs and a comparable number of Implementation Plans remain to be developed and submitted to EPA through 2010 in accordance with the Consent Decree. Shown below in Table ES-3 are projected costs for developing 353 TMDLs and Implementation Plans. The costs for developing TMDLs for the 260 shellfish waters are not included because neither EPA nor DEQ have yet developed the appropriate methodology for this type of TMDL. Based

on state agency experience with developing TMDLs to date, the projected cost of the program is estimated at \$59.1 million over this ten-year period. This estimate includes additional positions to meet the increasing workload of the TMDL program; DEQ needs 18 positions and DCR needs 25 positions dedicated to the program.

Total State and Federal funds available to the three state agencies for this same period are estimated at \$18.2 million, leaving a deficit of \$40.8 million if no additional funds are provided to the TMDL program. Virginia's cost estimates are comparable to estimates from other states.

The projected federal funding is less than 31% of the projected costs of developing TMDLs and TMDL Implementation Plans. This means the Commonwealth must provide almost 70% of the projected funding for the program. The projected federal contribution is not adequate. The Commonwealth should aggressively promote a higher contribution, at least 50%, from the federal government for the TMDL program.

Table ES-3
TMDL Costs, Funds, and Deficit (\$)

Biennium	Costs*	Funds	Deficit
2000 – 2002	4,884,610	3,427,500	1,457,110
2002 – 2004	12,328,800	3,699,000	8,629,800
2004 – 2006	14,040,340	3,699,000	10,341,340
2006 – 2008	15,478,380	3,699,000	11,779,380
2008 – 2010	12,331,260	3,699,000	8,632,260
Totals	59,063,390	18,223,500	40,839,890

*Does not include costs for shellfish TMDLs and implementation

Estimating reliable costs for shellfish TMDL development and the total costs of TMDL implementation is very difficult due to the absence of good information. Based on the cost estimates in the recently contracted Implementation Plans for fecal coliform bacteria TMDLs, cost range from \$400,000 to \$800,000 per watershed for implementation of the TMDL(s). Excluding shellfish TMDLs, overall TMDL implementation could be in the range of \$150 million to \$300 million. These costs are very preliminary, based on very limited information, a single pollutant, and a land use that is predominately agriculture. Other pollutants in an urban watershed could have much higher implementation costs.

Cost estimates to remove the Chesapeake Bay and its tidal rivers from the impaired water list are also preliminary. The current estimate to implement the existing Chesapeake Bay Tributary Strategies is approximately \$275 million dollars in state funds (assuming the Virginia Water Quality Improvement Fund was used to cost-share the costs). Under the 2000 Chesapeake Bay Agreement, the Tributary Strategies will need to be revised in order to achieve the water quality standards for the Bay and its tidal rivers. The revised Tributary Strategies will most likely be more costly to implement, but the amount of the increase is unknown at this time.

Options for Financing and Administering the TMDL Program

Currently the Commonwealth is contracting for all TMDL modeling and development. As DEQ, DCR, and DMME gain experience in developing TMDLs, it may become beneficial to divide the development workload between in-house development and outside contracting.

Some options discussed by the stakeholder group are included below.

1. An option to help in financing the TMDL program is to cost-share TMDL development with stakeholders who are willing to pay a portion of the costs.
2. The Interstate Commission on the Potomac River Basin (ICPRB) receives grant money from EPA under §106 of the Clean Water Act. This money is to be used, in part, to fund TMDL development in the Potomac River basin states. Based upon the amount of funding received by ICPRB, Virginia anticipates ICPRB funding the development of one to two TMDLs per year in the Potomac River basin.
3. VDEQ and the other state agencies involved will continue to seek innovative sources of funding. For example, under VDEQ's enforcement program, it may be appropriate to use Supplemental Environmental Projects (SEPs) to fund development of TMDLs, Implementation Plans and the installation of pollution controls associated with TMDLs. SEPs can be used in settling civil or administrative penalties, to pay for environmentally beneficial projects in the immediate geographical area of the facility being assessed the penalty.
4. If DEQ and the participating state agencies receive partial funding for meeting the requirements of the TMDL schedule in the Consent Decree, EPA will assume responsibility for development of some TMDLs to insure the Consent Decree schedule is met. The level of federal funding would most likely be impacted under this option since EPA would use these funds for TMDLs they developed.
5. If the Commonwealth decides not to implement the TMDL program, then EPA will take the leadership role in the program. In a federalized program, the Commonwealth would give up management control and would give up its key decision making role in the pollutant loading allocation and remediation scenarios. Most, if not all of the federally funded water program grants would be eliminated, or, at best, be significantly reduced. Also, significant program and fiscal sanctions would be imposed on any remaining funds. All water programs would suffer as a result. The currently successful collaborative approach between State agencies, EPA, and local stakeholders would severely diminish. A significant number of additional FTEs would still be required, at a lower level than if Virginia maintains the TMDL program, to provide the interface with EPA and to implement TMDLs at the local level.

Framework for Pollution Reduction

Implementation of §303(d) of the Clean Water Act represents a significant expansion in the way water quality is managed. For decades water quality management has focused on the effluent quality of the point sources. The TMDL program expands water quality management to the ambient quality of impaired streams, lakes and estuaries. While the TMDL program has significant implications for the point sources, probably the most significant impact is on the nonpoint sources. The implementation of Virginia's TMDL program presents significant challenges for the Commonwealth. TMDLs provide the framework for the pollution reductions needed to bring a water body back into compliance with water quality standards. Public participation is a critical part of the TMDL development process.

As the TMDL for a watershed is developed, results of the study are shared with stakeholders living in the watershed at a series of formal and informal meetings. Results include a breakdown of the pollutant loading, by category, for the particular pollutant in question. Usually, the results will include recommended percent reductions of pollutants from the different categories of sources to achieve compliance with water quality standards. Implementation of pollution controls can be expensive. Issues of equity arise in determining what segments of the community will bear the costs of achieving pollution reductions. A key factor in the equity issue is that point sources are administratively easier to control than non-point sources, so most of the burden of pollution reductions in the past have fallen on the point sources. For the farming sector, certain economic and assistance programs are emerging, such as the availability of loans from the Virginia Revolving Loan Fund for certain CAFO practices in addition to DCR/NRCS's existing suite of cost-share and tax incentive programs.

Often, there is more than one viable way to achieve pollution reductions and restore water quality. In these cases the input of the stakeholders in the watershed at public meetings is especially important. For the TMDL program, Virginia pioneered the “matrix of options” approach with EPA. One important final element of the pollution reduction framework is phased implementation. “Phased implementation” means that the most cost-effective methods of pollution control are applied first. As these measures take effect, continued water quality monitoring in the watershed documents the improvement in water quality. In many cases, it is expected that water quality goals can be achieved short of applying more costly measures.

Future Issues and Options Impacting the TMDL Program

DEQ has recently initiated a rulemaking proposing the development of a TMDL Planning regulation that will include: a public participation process for TMDL development, procedures for submittal of proposed TMDLs to the EPA for approval, subsequent adoption of the TMDL by the SWCB, and inclusion of TMDLs and TMDL implementation plans into the states' Water Quality Management Plans. The secondary proposed action in the rulemaking is the repeal of the existing WQMPs. The majority of the existing regulatory plans are obsolete because plan recommendations have been implemented. The repeal of these plans will clear the Registrar's books of unnecessary and outdated regulations and will eliminate the potential for inconsistencies with TMDLs as they are developed from more current information and collaborative input from stakeholders.

On July 11, 2000 EPA issued revisions to the federal Water Quality Management Planning and Management Regulation, as well as to the National Pollution Discharge Elimination System (NPDES) permit regulations. The revisions to each related primarily to the TMDL program. These new rules are not effective until November 1, 2001. Several effects can be anticipated.

First, states will have to submit a 303(d) list of impaired waters every four years, instead of every two. Second, the new rules provide some additional flexibility to the states for completing TMDLs for the waters on their 303(d) lists. Unfortunately, this additional flexibility is not available to Virginia since EPA is operating under the Consent Decree schedule (described in Section Two). EPA will have to successfully petition the federal court to allow any deviation from the court ordered schedule. Under the new rule, a TMDL is defined as a written quantitative plan and analysis for attaining and maintaining water quality standards in all seasons for a specific waterbody and pollutant. The TMDL must contain eleven elements, including an allowance for reasonable growth and an Implementation Plan.

The TMDL program has also stimulated focus to re-examine Virginia's Water Quality Standards. The most common cause for listing water segments as impaired is violation of the state Water Quality Standard for fecal coliform bacteria. However, at EPA's recommendation, the DEQ has asked the Department of Planning and Budget for approval to publish a notice of intended regulatory action (NOIRA) on the subject of alternate bacterial indicator species. Also, in the early 1980's the agency decided to designate all waters for primary contact recreation. As the 303(d) list of impaired waters gained importance to the non-point users of a water body, this use designation has undergone scrutiny. Therefore, as part of the same NOIRA mentioned above, DEQ has also asked for approval to reconsider changing the primary use designations. This may mean some streams could be more appropriately designated for secondary contact recreation and others may be designated at different “levels” of primary contact recreation (for example, seasonal uses). This means that some waters may be removed from the impaired water list or the achievement of the appropriate bacterial quality would be less challenging. Additionally, for more than two decades DEQ has maintained a statewide biological monitoring program for freshwater, wadeable streams that utilizes macroinvertebrates as indicators of water quality impairment. There are several concerns expressed by some stakeholders about the use of these data in listing waters on the

303(d) list as well as how benthic TMDLs are developed. DEQ has identified and is exploring several actions/measures to address these concerns and to improve the scientific defensibility of Virginia's biomonitoring methods.

Overall the TMDL program is the ultimate process for the restoration of impaired waterbody segments in Virginia.

Section One – Background

This report is presented to the Governor and the Chairs of the House Committees on Appropriations and Conservation and Natural Resources, and the Chairs of the Senate Committees on Finance and Agriculture, Conservation and Natural Resources in response to Item 415.F.1, contained in the 2000 Appropriations Act.

Under federal and state law, the Commonwealth of Virginia is required to monitor its rivers, lakes and tidal waters for pollutants. Field tests are conducted, and water samples are collected for laboratory analysis. Test results are compared to criteria established in the State's water quality standards regulation, which sets limits for concentrations of pollutants in our public waterways. Virginia has water quality standards for over 130 different pollutants, to protect such beneficial uses as swimming, fishing, and the use of streams and lakes as sources of drinking water.

The Commonwealth is required to report these water quality monitoring results to the Environmental Protection Agency (EPA) and to the citizens of Virginia. §303(d) of the Clean Water Act of 1972 requires the states to develop a list of those waters violating water quality standards and submit this list to EPA. In July, 1992, EPA promulgated regulations requiring the states to develop a list of impaired waters and submit the list to EPA on April 1 of even numbered years. Also, EPA's regulations required the 303(d) List to be developed by the states and submitted to EPA on April 1, 1994. The list is to describe individually each of the waters in the State with violations of Water Quality Standards. Beginning in 1998, Virginia and other States were required to go one step further; to prepare plans for restoring the quality of polluted waters. These restoration plans are called TMDL Reports. The term TMDL stands for Total Maximum Daily Load, a mathematical modeling term that represents the total quantity of a pollutant that a water body can assimilate and still meet water quality standards.

A TMDL Report is the product of a special study to identify all sources of pollution contributing to a violation of water quality standards. For bacteria, for example, run-off from pastures, failing septic tanks, leaking sewer lines and many other potential sources would be investigated. Once the pollution sources have been identified, investigators calculate the amount of pollutants entering the stream from each source. Next, the reductions in pollutant loads needed to restore the stream to water quality standards are calculated. Usually, several options for distributing those reductions between the sources are considered. Finally, an Implementation Plan must be developed to identify specific pollution control measures that must be undertaken to restore water quality.

Public participation is an integral part of the TMDL development process. Citizens in the affected watershed are encouraged to attend public meetings where presentations are made on the findings of the TMDL study. Special meetings with key stakeholders are also held to inform them of the results of the study and to get their opinions on the accuracy of the report and the practicality of proposed plans for pollution reductions.

Once a TMDL report has been completed, the report is submitted to EPA for review and approval. When EPA's approval is received, the TMDL is submitted to the State Water Control Board (Board) for adoption. Following adoption by the Board, the approved TMDL becomes part of the Water Quality Management Plan for the watershed where the segment is located.

Preparation of the TMDL List of Impaired Waters, preparation of TMDL Reports and Implementation Plans, and the administrative work associated with the public participation aspects has generated a considerable additional workload for the agencies charged with the

conduct of this program. To date, most of the work has fallen to two agencies, the Department of Conservation and Recreation (DCR) and the Department of Environmental Quality (DEQ). In the near future, two additional state agencies, the Department of Mines, Minerals and Energy (DMME) and the Department of Health (VDH) will also have requirements placed upon them by the TMDL process.

For the state 2001-2002 biennial budget, both DCR and DEQ submitted budget requests for additional funds and positions to take on the increasing workload imposed by the TMDL program. The Virginia General Assembly responded with partial funding for the agencies and some additional positions for DEQ. In addition, the General Assembly directed the agencies to prepare a comprehensive plan for implementation of the TMDL program through the year 2010. **Appendix A** contains the language from the 2000 Appropriations Act directing the development of this Plan. The legislation directed DEQ to submit the plan by Nov. 1, 2000 to the Governor, the Chairs of the House Committees on Appropriations and Conservation and Natural Resources, and the Chairs of the Senate Committees on Finance and Agriculture, Conservation and Natural Resources.

The Appropriations Act also directed the agencies to establish a Stakeholders Advisory Committee to provide input on development of this report. **Appendix B** contains a list of the members on the Advisory Committee. The Committee met two times and provided valuable comment and advice to the staff of the state agencies. Members of the Stakeholders Advisory Committee have been invited to submit additional comments on the final version of this report. Any additional comments received from the Stakeholders Advisory Committee will be summarized and appended to future presentations of the report.

The report that follows is the combined agency response to the legislature's directive to produce a plan for the conduct of the TMDL program in Virginia for the next decade.

Section Two – What Are TMDLs?

Legal and Regulatory Framework

§303(d) of the 1972 Clean Water Act requires the states to identify waters not in compliance with water quality standards, establish priorities for scheduling the development of TMDLs, develop a list of the impaired waters, and develop TMDLs for the waters on the §303(d) list. In July, 1992, EPA promulgated regulations, 40 CFR §130.7, for §303(d) of the Clean Water Act. The Clean Water Act and the enabling regulations did not contain additional implementation measures. TMDLs were to be implemented through existing pollution reduction regulations and voluntary strategies. However, EPA promulgated revised 303(d) regulations in July, 2000. These regulations, to become effective on November 1, 2001, require the states to develop a TMDL Implementation Plan as a component of each TMDL.

In 1997, the Virginia General Assembly enacted the Water Quality Monitoring, Information, and Restoration Act, §62.1-44.19:4 through 19:8 of the Code of Virginia. This statute directs DEQ to develop a list of impaired waters and develop TMDLs for these waters. Also, the state statute directs DEQ to develop Implementation Plans for the TMDLs.

In 1998, DEQ and DCR signed a Memorandum of Understanding (MOU) with EPA agreeing to develop TMDLs in accordance with a schedule for the 247 impaired waters on Virginia's 1998 303(d) List.

The MOU schedule was replaced a year later, by a schedule in a Consent Decree filed in the United States District Court for the Eastern District of Virginia. The American Canoe Association and the American Littoral Society filed a complaint against EPA for failure to comply with the provisions of §303(d) of the Clean Water Act in Virginia. In 1999, EPA signed a Consent Decree with the plaintiffs. The consent decree contained a TMDL development schedule through year 2010, replacing the one in the MOU. In addition to the schedule, a number of other aspects of listing impaired waters and TMDL development are impacted by provisions of the Consent Decree.

Roles and Responsibilities of State Agencies

DEQ estimates that 600 impaired waters will need 648 TMDLs developed and submitted to EPA by 2010. Some waters are impaired for more than one parameter and need more than one TMDL. More information is given on the impaired waters and TMDL numbers later in the report on page 2-7 and Table II-1.

Each TMDL has a point source component and a nonpoint source component that must be evaluated and incorporated into the TMDL study. Both components have to be addressed in all TMDLs. However, in many TMDLs one of the components can be very small or insignificant. The following is a brief overview of the relative impacts of the point source and nonpoint components on TMDL development:

- About 50% or 170 of the impaired waters, excluding the 260 shellfish waters, will have point source or waste load allocation (WLA) components in their TMDLs.
- About 50% or 170 of the impaired waters, excluding shellfish waters, will have nonpoint source or load allocation (LA) components and negligible or insignificant point source or WLA components in their TMDLs.

Coal mining is solely or predominately responsible for pollutants causing the listing of 19 of these waters. Mineral extraction activities are identified as the cause of impairment on 3 other listed waters. These are part of the 247 waters DEQ identified as impaired on the 1998 List

The sources of impairment have not been identified at this time for most of the shellfish waters listed for TMDL development.

1. Department of Environmental Quality (DEQ)

The State Water Control Law authorizes the State Water Control Board to control and plan for the reduction of pollutants impacting the chemical and biological quality of the state's waters resulting in the degradation of the swimming, fishing, shell fishing, aquatic life, and drinking water uses. For many years the focus of DEQ's pollution reduction efforts was the treated effluent discharged into Virginia's waters via the VPDES permit process. The TMDL process has expanded the focus of DEQ's pollution reduction efforts from the effluent of wastewater treatment plants to the pollutants causing impairments of the streams, lakes, and estuaries. The reduction tools are being expanded beyond the permit process to include a variety of voluntary strategies and BMPs.

The DEQ is the lead agency in the TMDL process. The Code of Virginia directs DEQ to develop a list of impaired waters, develop TMDLs for these waters, and develop Implementation Plans for the TMDLs. DEQ administers the TMDL process including the public participation component and formally submits the TMDLs to EPA and the State Water Control Board for approval.

Additionally, the §303(e) of the Clean Water Act and EPA's water quality management regulation 40 CFR 130.5 requires the states to develop Water Quality Management Plans (WQMP) for the major watersheds. The purpose of the WQMPs is to present the processes to be used in the watershed for attaining and maintaining water quality standards. Also, the WQMPs serve as the repository for all TMDLs and TMDL Implementation Plans developed within the watershed. DEQ, with the assistance of DCR, DMME, and VDH plans to update the state's 303(e) WQMPs concurrently with the TMDL development effort.

2. Department of Conservation and Recreation (DCR)

DCR is authorized to administer Virginia's nonpoint source pollution reduction programs in accordance with §10.1-104.1 of the Code of Virginia and §319 of the Clean Water Act. EPA is requiring that much of the §319 grant monies be used for the development of TMDLs.

Because of the magnitude of the nonpoint source component in the TMDL process, DCR is a major participant in the TMDL process. DEQ and DCR have signed a Memorandum of Understanding agreeing to a cooperative effort in the TMDL process including Implementation Plan development. Specifically, DCR agreed to assume responsibility for the nonpoint source component of all TMDLs, with the exception of mineral extraction, including the final allocations. This includes those TMDLs contracted by DEQ. Also, DCR agreed to present the nonpoint source component of the TMDLs in the public forums. Another major role DCR has in the TMDL process is the awarding and managing the contractual services for the development of TMDLs related to nonpoint sources.

3. Department of Mines, Minerals, and Energy (DMME)

The DMME is authorized by §45.1-254 of the Code of Virginia to issue both Coal Surface Mining Operation (CSMO) permits and by the Clean Water Act to issue National Pollution Discharge Elimination System (NPDES) permits for industrial discharges from coal mining operations. On September 5, 2000, DEQ and DMME signed a Memorandum of Understanding (MOU) agreeing to a cooperative effort in the TMDL process as it relates to mining impairments.

The DMME administers the mineral extraction component of the TMDL process, awards and manages contractual services for TMDL development and special TMDL related studies, and participates in the public participation process.

4. Virginia Department of Health (VDH)

The VDH is responsible for classifying shellfish growing waters and monitoring the waters for fecal coliform bacteria. Also, the VDH conducts shoreline surveys to determine potential sources of contamination. This information is evaluated by the VDH to determine areas that are open or restricted for shellfish harvesting for direct marketing. DEQ places the restricted areas on the 303(d) List for TMDL development.

Major Steps in TMDL Process

1. The first step in the TMDL process is listing the water as impaired. This is done by a comparative analysis of existing water quality data to the relevant water quality standard. Also, the cause and extent of the impairment(s) are identified in this process. The source of the pollutant is identified if known. Listing of waters for TMDL development is an integrated process involving monitoring, water quality standards, and VPDES permits.
2. The second step in the process is the prioritization of impaired waters for TMDL development. Prioritization is currently being based largely on the availability of data needed for the TMDL. Most of the impaired waters with adequate data for accurate TMDL development have been used to meet the submittal schedules for 2000 and 2002. Prioritization of impaired waters for TMDL development for future years is based on severity of impairment, presence of endangered species, public interest, and efficiency in public participation.
3. Next in the sequence is the selection of a contractor and awarding the contract for assessments and modeling of contributing sources and other assistance in the development of the TMDL. DEQ, DCR, and DMME award contracts for TMDL development in accordance to the agreements in the Memoranda of Understanding.
4. After awarding the contract, the data acquisition phase of the TMDL begins. The listing of a water as impaired is usually based on data from a single ambient chemical and/or biological monitoring station. Therefore, water quality variations and stream flow for much of the impaired watershed is unknown. To obtain this information, DEQ, working with the contractor and TMDL team, makes an extensive synoptic water quality monitoring sweep of the watershed to obtain data needed for the TMDL development. Also, stream flow measurements are made at each synoptic monitoring site. TMDLs must be based on credible scientific data and analysis.
5. The public participation process starts shortly after the contract is awarded. A public notice is placed in the Virginia Register and local newspaper(s) announcing the start of TMDL development, time and place for a public meeting, and that the participating state agencies are seeking public comment on the TMDL. Generally, each TMDL has three public notices and meetings during the development process. Also, staff of the participating agencies attend stakeholder and focus group meetings upon request.
6. After completion of the public participation process, DEQ submits the completed TMDL to EPA for approval.
7. TMDL is presented to the State Water Control Board for adoption after EPA approval.
8. TMDL is incorporated into watershed Water Quality Management Plan.
9. The participating agencies start development of the Implementation Plan. The Implementation Plan will go through a similar public participation process as the TMDL with adoption by the State Water Control Board. Contractors will be used and there will be emphasis on focus group meetings along with the public meetings in the development process of the Implementation Plans. Implementation plans will be incorporated into the watershed Water Quality Management Plan. EPA's new TMDL regulations currently scheduled to become effective on November 1, 2001, will require development of the TMDL Implementation Plan as part of the TMDL. See Section Six for additional discussion of this issue.

10. Implementation of the TMDL will be conducted through a variety of mechanisms and programs. VPDES permits must be in compliance with the TMDLs. Also, a variety of other tools will be used including state and local laws and regulations, as well as voluntary based actions.

TMDL Modeling Process

The principal objective in the development of a TMDL is to characterize the potential sources of a pollutant in a watershed and to quantify the amount of pollutant reaching an impaired water from those sources. The primary tools used in these analyses are watershed models. Such models allow the evaluation of historic and current stream conditions, enable the user to assess how changes in loads from sources will affect stream conditions, and provide information for exploring opportunities in improved management practices.

The first step in the development of a watershed model is the collection of data relevant to potential sources of a pollutant in that watershed. Such data includes: land use, point source discharges, livestock populations, number of septic systems, typical agricultural practices, and wildlife populations. A watershed model is then constructed by using this information in combination with data that physically describes the soils, slope, and stream network within the watershed. The next major component in the modeling process is calibration. This is a process that involves comparing actual stream flow and water quality data with model output to make sure that they match. Once a model is adequately calibrated it is possible to assess how reductions from various sources will affect water quality conditions. The end result of the TMDL is to identify potential combinations of source reductions that will attain water quality standards.

How the 1998 List of Impaired Waters Was Developed

DEQ developed the 1998 303(d) TMDL List as part of the biennial assessment of all chemical and biological data taken in accordance with approved EPA protocols during the previous 5 years. EPA approved the waters that were on the list submitted by DEQ, but found the list incomplete, and added waters. The following sections describe the four components that make up the approved 1998 List, both state and federally listed waters. The first column in Table II-1 shows that the number of waters currently identified as impaired in Virginia is 803.

1. DEQ Waters

During the 1998 assessment, water quality data from over 1,600 monitoring stations were compared with the water quality standards. Two hundred forty seven waters were found to exceed the standards and DEQ listed these waters as impaired. In addition to the chemical and biological water quality assessments, DEQ includes waters where the VDH has enacted advisories or restrictions on fish consumption.

2. Shellfish Waters

DEQ listed 285 waters on the 1998 TMDL List for shellfish restrictions or prohibitions enacted by the VDH.

3. EPA Additions

Although EPA Region III approved DEQ's 303(d) TMDL List, they found it incomplete. In May, 1999, EPA added 71 other waters to Virginia's 1998 List for TMDL development which include the Chesapeake Bay, and its tidal tributaries.

4. Consent Decree Additions

In May 1999 EPA entered into a Consent Decree with the American Canoe Association and the American Littoral Society to settle their lawsuit over the implementation of the TMDL program in Virginia.

The plaintiffs identified 200 waters in the Consent Decree that they believed DEQ should have included on the 1998 list. These were waters that DEQ designated as “threatened” and the agency continues to monitor these waters. DEQ believed that there was insufficient data on these waters in 1998 to make a listing decision.

Number of Waters Identified for TMDL Action and Total Number of TMDLs

As shown in Table II-1 DEQ estimates the number of waters identified for TMDL action to be 600 and the actual number of TMDLs to be developed by 2010 to be 648, based on the following projections.

DEQ Waters

DEQ expects that TMDLs will be needed for all of the 247 impaired waters it listed. However, 43 of the 247 impaired stream segments are impaired for either two or three pollutants. In order for the segment to count in the schedule tally, TMDLs must be developed for each pollutant causing the impairment of the segment. Since a TMDL is required for each pollutant, 295 TMDLs are needed on these 247 impaired waters by 2010.

Shellfish Waters

Due to uncertainties in how TMDLs for shellfish waters should be developed, EPA and DEQ are moving forward in developing a protocol for shellfish TMDLs. EPA has recently stated that Virginia could de-list some shellfish waters based on the following conditions:

- The closing was based on an administrative action rather than the documented presence of pollutants. Examples are seasonal closing of shellfish waters near marinas and buffer zone designations around the outfalls of wastewater treatment plants.
- The water has not supported the shellfish use since 1975.

After EPA provides the details of de-listing in writing, DEQ will meet with the VDH Division of Shellfish Sanitation to identify the waters meeting EPA’s new criteria for listing and de-listing shellfish waters. DEQ anticipates the final number of shellfish waters needing TMDLs to be about 260 or less. This number, 260, is used in this report as the estimate of the number of shellfish waters needing TMDLs by 2010.

EPA Additions

Of the 71 EPA additions, DEQ believes about 18 will need TMDLs. This is the number used in this report as an estimate of the number of waters needing TMDLs by 2010 due to EPA’s additions.

- Forty-six of the additions were waters impaired due to natural conditions. An example is a wetland or swamp that have naturally occurring low concentrations of dissolved oxygen and low pHs. DEQ has proposed a modification to the Water Quality Standards to properly classify waters impaired due to natural conditions. DEQ will request EPA to approve their removal from a subsequent List based on the change in the Water Quality Standards.
- Eighteen of these additions were added for various reasons. DEQ had classified many of these as “threatened” rather than impaired because of very small data sets. DEQ

believes that TMDLs will need to be developed for most, if not all, of these 18 waters by year 2010.

- Seven of these waters, including the Chesapeake Bay and its tidal tributaries, were listed as impaired because they exceeded EPA guidelines for nutrients. These waters are being addressed through the 2000 Chesapeake Bay Agreement and Water Quality Improvement Act (WQIA), so no TMDL prior to 2010 is expected.

Recently, EPA agreed to a 10 year moratorium on the development of a nutrient TMDL for the Chesapeake Bay and tidal tributaries to allow the Bay states to continue with their cooperative efforts on nutrient reductions in accordance with the 2000 Chesapeake Bay Agreement. The goal of the Agreement is to work towards improving the water quality in the Bay and its tidal rivers so these waters meet standards and can be removed, or "de-listed", from the 303(d) list of impaired waters by 2010. If these water quality improvements do not occur, then a TMDL for these waters will need to be completed by May 2011, the final date included in the Consent Decree.

Consent Decree Additions

Based on the 2000 water quality assessment for the 305(b) Water Quality Report, DEQ estimates that out of the 200 waters identified by the plaintiffs about 75 waters will be added to the 2002 303(d) List that will require TMDLs by 2010. This number, 75, is used in this report as the estimate of the number of TMDLs needed by 2010.

DEQ expects the number of TMDLs projected for development by 2010 will most likely change in the future based on changes in water quality standards, EPA listing guidance, de-listings, and changes in water quality conditions. For example, EPA is expected to develop water-type technical guidance and region-specific nutrient criteria by the end of year 2000. The waters being considered are lakes, rivers and estuaries. Once water-type guidance and nutrient criteria are established, EPA expects the States to adopt these numerical nutrient criteria into state water quality standards by the end of 2003. After the numerical nutrient criteria are developed, a number of additional waters may be added to the 303(d) list for violations of the nutrient criteria.

At the present time, DEQ will use the estimates shown in Table II-1 as the basis for the cost projections shown in Section 3 of this report.

Table II-1
Impaired Waters for TMDL Action and Number of TMDLs
Due by 2010

	Number of Waters Identified as Impaired	Number of Waters Identified for TMDL Action	Estimated Number of TMDLs
DEQ Waters	247	247	295
DEQ Shellfish Waters	285	260	260
EPA Additions	71	18	18
Consent Decree Additions	200	75	75
Totals	803	600	648*

* 35 TMDL Contracts Awarded

Schedule of TMDL Development

Virginia's TMDL schedules through year 2010 are shown in Tables II-2, II-3, II-4 and II-5. These schedules were set by the Consent Decree EPA signed with American Canoe Association and the American Littoral Society in 1999. The plaintiffs filed a complaint against EPA for failure to comply with the provisions of §303(d) of the Clean Water Act in Virginia and the resulting order establishes schedules and guidelines for the development of these TMDLs by either Virginia or EPA.

Table II-2 presents the basic Consent Decree development schedule. Under the schedule, the Commonwealth is expected to submit the identified number of TMDLs on each even numbered year during the decade. If the required TMDLs are not completed, EPA is required by the Consent Decree to complete the TMDLs within the following year.

The Consent Decree allows Virginia limited credit on the schedule for waters removed from the TMDL list. EPA has identified four basic scenarios for removing waters from the list based on the following:

- more recent data showing that the impairment no longer exists;
- more recent and updated water quality modeling demonstrates that the impaired water is now meeting water quality standards;
- changes in water quality standards result in the attainment of the applicable standard; or,
- errors were made in the initial listing of the impaired water.

EPA has to approve the removal of any water from the impaired waters list.

Table II-2
Consent Decree TMDL Development Schedule *

Submittal Dates	EPA Action Dates	Consent Decree (Current Schedule for Impaired Waters)	Credit Limit for Waters Removed from List
5/1/99	5/1/00	1	0
5/1/00	5/1/01	12	2
5/1/02	5/1/03	30	6
5/1/04	5/1/05	55	11
5/1/06	5/1/07	64	13
5/1/08	5/1/09	69	14
5/1/10	5/1/11	70	14
TOTAL		301**	60

* Does not include TMDLs for Plaintiff's waters and shellfish waters – see Tables II-3 and II-4.

** Number is based on EPA's additions to Virginia's 1998 List at the time the Consent Decree was filed in June 1998.

The Consent Decree also contains a schedule for completion of the TMDLs, beginning in 2004, for the waters the plaintiffs thought should be listed. A fixed percentage of the TMDLs must be developed for these waters before 2010 in accordance with the schedule shown in Table II-3.

Table II-3
Consent Decree TMDL Schedule for any of 200 Waters Plaintiffs Believe DEQ Should Have Listed as Impaired

% Anticipated on 2002 List	Date for DEQ Action	Date for EPA Action
25% - (19)*	5-1-04	5-1-05
50% - (19)*	5-1-06	5-1-07
75% - (19)*	5-1-08	5-1-09
100% - (18)*	5-1-10	5-1-11

* 75 - Current estimate of the number of TMDLs to be added in 2002.

Table II-4 shows the Consent Decree schedule for TMDL development on the 260 shellfish waters listed as impaired due to the VDH's restrictions on harvesting and consumption. EPA is required by the consent decree to provide Virginia guidance in 2002 on the development of shellfish TMDLs. After EPA completes the shellfish guidance, DEQ with the assistance of the Department of Health will develop schedule and cost estimates for the shellfish TMDLs in 2002.

Table II-4
Consent Decree TMDL Schedule for Shellfish Waters

260 Shellfish Waters	Date for DEQ Action	Date for EPA Action
50% - (130)*	5-1-06	5-1-07
65% - (39)*	5-1-08	5-1-09
100% - (91)*	5-1-10	5-1-11

* 260 - Current estimate of the number of TMDLs to be developed.

Table II-5 combines the schedules presented in the above tables in order to give an estimate of the total number of TMDLs scheduled for completion under the Consent Decree.

Table II-5
Total Consent Decree TMDL Schedule

Submittal Dates	EPA Action Dates	Consent Decree (Current Schedule for Impaired Waters)	Credit Limit for Waters Removed from List
5/1/99	5/1/00	1	0
5/1/00	5/1/01	12	2
5/1/02	5/1/03	30	6
5/1/04	5/1/05	74	11
5/1/06	5/1/07	213	13
5/1/08	5/1/09	127	14
5/1/10	5/1/11	179	14
TOTAL		636*	60

* DEQ identified 648 TMDLs for development in 600 impaired waters

Public Participation Process

Public input is crucial to the TMDL and the TMDL Implementation Plan processes. Virginia's TMDL public participation process exceeds EPA requirements.

- A notice is placed in the Virginia Register and local newspaper(s) announcing the start of the TMDL development process, time and place for a public meeting, and that the participating state agencies are seeking public comment on the TMDL.
- Local governments and Planning District Commissions are notified
- Environmental and other stakeholder organizations with statewide or regional membership are also notified so their members in the local watershed can be invited to participate.
- Following the notification process outlined above, a second public meeting is held on the TMDL process after all pollutant sources are identified and pollutant loads to the stream are calculated.
- Following the notification process outlined above, a third public meeting is held on the draft TMDL.
- Staff of the participating agencies attend stakeholder and focus group meetings upon request.
- If there is significant public interest, DEQ will hold a public hearing on the TMDL.
- DEQ submits the final TMDL to EPA Region III for approval.

- After EPA approval, DEQ presents the TMDL to State Water Control Board for adoption and request authorization to include the TMDL in watershed Water Quality Management Plan.

Development of TMDL Implementation Plans

The Water Quality Monitoring, Information, and Restoration Act (WQMIRA), §62.1-44.19:4 Code of Virginia, directs DEQ to develop and implement a plan to achieve fully supporting status for impaired waters, except when the impairment is established as naturally occurring. The plan is to include the date of expected achievement of water quality objectives, measurable goals, the corrective actions necessary, and the associated costs, benefits, and environmental impact of addressing impairment and the expeditious development and implementation of TMDLs when appropriate.

Under the Clean Water Act, the TMDL rules are more general than under the WQMIRA. The 1992 TMDL regulations under the Clean Water Act state:

“The purpose of the Implementation Plan is to provide a description, in a level of detail appropriate to the circumstances, of actions necessary to implement the TMDL, so that the waterbody attains and maintains water quality standards.”

“For waterbodies impaired only by nonpoint source(s), storm water sources for which an NPDES permit is not required, atmospheric deposition, ground water or background sources of a pollutant where no NPDES permit will implement the TMDL, the Implementation Plan must include:

...(ii)A description of specific regulatory or voluntary actions, including management measures or other controls, by Federal, State or local governments, authorized Tribes, or individuals that provide reasonable assurances, consistent with §130.2(p), that load allocations will be implemented and achieve the assigned load reductions. Your selection of management measures for achieving the load allocation may recognize both the natural variability and the difficulty in precisely predicting the performance of management measures over time.”

““Reasonable assurance” as defined means “a demonstration that TMDLs will be implemented through regulatory or voluntary actions, including management measures or other controls, by Federal, State, or local governments, authorized Tribes, or individuals.” 40 C.F.R. §130.2(P).”

Also, EPA’s recently revised regulations require Implementation Plans as part of the TMDL.

The Implementation Plans will go through the same public participation process as the TMDL. The Board will adopt the Implementation Plans and they will be incorporated into the Water Quality Management Plan for the watershed.

As noted previously, under the 2000 Chesapeake Bay Agreement, the Commonwealth of Virginia, along with its Bay Program partners, has committed to improve the water quality in the Bay and its tidal rivers to meet the goal of delisting these waters by 2010. Although neither TMDLs nor TMDL Implementation Plans for the Bay are expected before that date, actions to improve water quality are guided by the Chesapeake Bay Tributary Strategies, developed in accordance with Chapter 5.1 of Title 2.1, Article 2 of the Code of Virginia. In accordance with the 2000 Chesapeake Bay Agreement, the Commonwealth’s existing Tributary Strategies will be revised in 2002 to identify the nutrient reduction actions needed to meet the water quality standards, which will allow delisting of the Bay and its tidal rivers from the impaired waters list.

TMDL Implementation

Federal regulations require that VPDES permits be in compliance with the reduction allocations contained in the TMDL. Federal and State laws and regulations have created no new TMDL regulatory controls for the reduction of pollutants entering state waters. TMDL implementation depends upon existing corrective action mechanisms such as VPDES permits, voluntary BMPs, and other reduction strategies. The waste load allocation (WLA) or point source component of the TMDL must depend upon the VPDES permit to achieve the reductions contained in the TMDL allocations. The load allocation (LA) component from diffuse or nonpoint sources will continue to depend upon voluntary BMPs and reduction strategies to achieve the pollutant reductions contained in the TMDL.

Stakeholder participation in the TMDL Implementation Plan process is necessary for the success of the TMDLs and the attainment of water quality standards for the impaired waters.

Continuous monitoring in the watershed will be needed to determine the effectiveness of the reduction strategies and verify the attainment of water quality standards for the removal of the water from the 303(d) List. As noted above, EPA has also identified four others ways waters can be removed from the List.

TMDL Development Schedule

A tentative schedule, in accordance with the Consent Decree, for developing TMDLs for the 247 waters listed by DEQ is shown in **Appendix C**. We anticipate this schedule will be adjusted frequently to reflect new information, data, and policy changes at EPA. The specific schedule for shellfish waters and the waters added by EPA and the Consent Decree will be developed following the generation of the 2002 303(d) list.

To date, 35 TMDLs have been contracted. Of these, EPA has approved 2 and 12 others have been completed and are under EPA review. These completed TMDLs fulfill the Consent Decree schedule for 1999 and 2000. The remaining TMDLs under contract partially meet the requirements of the Consent Decree for 2002, 2004 and 2006. **Appendix D** presents the most recent version of the tracking worksheet for the TMDLs scheduled for development between 1999 and 2002.

Tables II-6 and II-7 show Virginia's TMDL development schedule for the 247 impaired waters listed by DEQ for each major river basin and DEQ's six regional offices.

Table II-6
Impaired Waters Schedule by Major River Basin

RIVER	2000	2002	2004	2006	2008	2010	TOTAL
POTOMAC	2	15	9	15	21	4	66
RAPPAHANNOCK	1	1	11	0	1	0	14
YORK	0	0	4	2	0	2	8
JAMES	0	5	5	6	26	12	54
CHOWAN	0	0	0	5	1	0	6
ROANOKE	6	3	6	9	8	8	40
NEW	0	2	0	7	3	0	12
TENN/BS	4	4	6	10	8	4	36
BAY/COASTAL	0	0	6	5	0	0	11
TOTAL	13	30	47	59	68	30	247

RIVER	2000	2002	2004	2006	2008	2010	TOTAL
POTOMAC	2	15	9	15	21	4	66
RAPPAHANNOCK	1	1	11	0	1	0	14
YORK	0	0	4	2	0	2	8
JAMES	0	5	5	6	26	12	54
CHOWAN	0	0	0	5	1	0	6
ROANOKE	6	3	6	9	8	8	40
NEW	0	2	0	7	3	0	12
TENN/BS	4	4	6	10	8	4	36
BAY/COASTAL	0	0	6	5	0	0	11
TOTAL	13	30	47	59	68	30	247

Table II-7

REGION	2000	2002	2004	2006	2008	2010	TOTAL
NRO	1	6	11	10	5	0	33
PRO	0	1	10	11	12	9	43
TRO	0	0	6	8	7	0	21
VRO	2	14	8	7	19	10	60
WCRO	6	5	6	11	14	7	49
SWRO	4	4	6	12	11	4	41
TOTAL	13	30	47	59	68	30	247

Impaired Waters Schedule by DEQ Regional Office

REGION	2000	2002	2004	2006	2008	2010	TOTAL
NRO	1	6	11	10	5	0	33
PRO	0	1	10	11	12	9	43
TRO	0	0	6	8	7	0	21
VRO	2	14	8	7	19	10	60
WCRO	6	5	6	11	14	7	49
SWRO	4	4	6	12	11	4	41
TOTAL	13	30	47	59	68	30	247

Section Three – Resource Needs

Costs To Develop TMDLs

The aggregated cost estimates for developing TMDLs and Implementation Plans through year 2010 is \$59.3 million as shown in Table III-1. These costs are apportioned to show individual agency needs in Tables III-2 through III-4. These costs are based on developing TMDLs for the following: a) the remaining 260 TMDLs from DEQ's 1998 impaired waters list; b) 18 waters EPA added to the List that will need TMDLs; and, c) waters listed in the Consent Decree the plaintiffs thought should have been listed – an estimate of 75 is used in this report; the final number will be determined by the 2002 impaired waters list. [NOTE: the previous numbers refer to the actual TMDLs that must be developed, and not the number of segments tracked in the Consent Decree.]

"TMDL contractual services" includes costs for TMDL development, land use determinations, fecal coliform bacteria typing, public participation, additional lab work for monitoring, staff travel, and printing. The Implementation Plan contractual services includes costs for Implementation Plan development, public participation, staff travel and printing.

Approximately 50% of the waters listed for TMDL development receive effluent from wastewater treatment plants with VPDES permits. DEQ will assume responsibility for administering the contracts on these waters. DCR has agreed to assume responsibility for administering the contractual services on the waters that do not have VPDES permit impacts. DMME will administer the contractual services for mineral extraction TMDLs. The technical and procedural responsibilities of each agency will be the same on each TMDL, regardless of the agency administering the contractual services.

The costs presented in Table III-1 do not include the costs for the TMDLs currently under development, the TMDL and Implementation Plan development costs of the 260 shellfish waters, or costs of implementation of the TMDLs. Shellfish TMDL and Shellfish Implementation Plan costs have been excluded from these resource needs because the appropriate methodology (watershed modeling versus source identification/spreadsheet analysis) have not been identified and therefore, any cost projections would be subject to significant error. The unit cost for the development of TMDLs and Implementation Plans was assumed to remain static through year 2010 because efficiency gains should offset inflation increases.

Staffing Needs

DEQ has 3 positions dedicated to the TMDL program, funded by the General Assembly through 2001. Two of these positions are assigned to the Central Office and one to the Regional Office with the heaviest workload. Several DEQ staff with other program responsibilities are absorbing a portion of the TMDL workload.

DCR has 3 positions dedicated to TMDL development that were funded and authorized by the General Assembly through June 2002. Another position, funded through general fund sources, is dedicated about 75% to the TMDL program. DCR staff with other program responsibilities are also absorbing a portion of the TMDL workload.

DEQ and DCR have been able to meet the requirements of the Consent Decree by absorbing much of the TMDL workload with existing staff and the recent position additions because of two factors. First, the consent decree required completion of TMDLs on only 13 impaired waters for 1999 and 2000. Second, to meet the schedule, the agencies selected impaired waters that had much of the TMDL input data already available. This information, such as land use, detailed water quality data, and stream flow measurements, had already been generated from previous

studies and projects. Very little additional input data for the TMDLs had to be developed on these impaired 13 waters.

Table II-5, on page 2-9 showed the number of impaired waters needing TMDL development in the consent decree. In each biennium the number of impaired waters scheduled for TMDL development increases dramatically. The number increases to 30 in 2002, 74 in 2004, and 213 in 2006. With the extensive stakeholder participation process, data assembly requirements, technical analysis, and modeling, it takes 6 to 9 months to develop a TMDL or TMDLs for impaired waters. Assuming development of TMDLs for the 213 impaired waters due on May 1, 2006, is started in that biennium, calendar years 2004 and 2005, this would mean a TMDL would have to be completed about every other work day to meet the goal. The only way Virginia will be able to meet these accelerating requirements of the Consent Decree is to move the TMDL development starting dates forward to spread the workload more evenly over the next 5 years. Another challenge in meeting the schedule is that input data will have to be gathered or expanded on most of the TMDLs developed in the future.

In addition to the workload of TMDL development, DEQ and DCR are starting development of TMDL Implementation Plans on completed TMDLs to comply with the Water Quality Monitoring, Information, and Restoration Act.

To accomplish the TMDL goals for 2002 and beyond, DEQ needs General Assembly reauthorization of the 3 existing TMDL positions plus 15 additional positions. These positions will be assigned to Central Office and the 6 Regional Offices.

DCR currently needs 6 additional regional office positions for developing TMDL Implementation Plans for completed TMDLs and reauthorization of the existing 3 fully and 1 partially dedicated TMDL positions. Also, as the workload increases, 15 additional positions are needed by DCR for development of TMDLs and TMDL Implementation Plans.

Appendix E, provides detailed information on the staffing needs. The personnel costs contain an inflation factor of 3% per year.

**Table III-1 Total Costs of TMDLs, Implementation Plans,
And Personnel through Year 2010 (\$)***

Biennium	TMDL Contract	Implementation Plan Contract	Personnel Cost	Total Cost
2002	1,746,330	800,280	2,338,000	4,884,610
2002 – 2004	5,639,240	1,663,740	5,134,000	12,436,980
2004 – 2006	6,458,420	1,726,920	5,855,000	14,040,340
2006 – 2008	7,144,440	2,084,940	6,249,000	15,478,380
2008 – 2010	5,736,880	1,552,380	5,192,000	12,481,260
Total Cost *	26,725,310	7,828,260	24,768,000	59,321,570

Biennium	TMDL Contract	Implementation Plan Contract	Personnel Cost	Total Cost
2002	1,746,330	800,280	2,338,000	4,884,610
2002 – 2004	5,531,060	1,663,740	5,134,000	12,328,800
2004 – 2006	6,458,420	1,726,920	5,855,000	14,040,340
2006 – 2008	7,144,440	2,084,940	6,249,000	15,478,380
2008 – 2010	5,661,880	1,477,380	5,192,000	12,331,260
Total Cost *	26,542,130	7,753,260	24,768,000	59,063,390

*Does not include costs for shellfish TMDLs or implementation

Table III-2
Department Of Environmental Quality Costs (\$)

Biennium	TMDL Contract	Implementation Plan Contract	Personnel Cost	Total Cost
2002	220,000	160,000	1,183,000	1,563,000
2002 – 2004	2,602,030	811,870	2,054,000	5,467,900
2004 – 2006	2,963,710	823,460	2,115,000	5,902,170
2006 – 2008	3,402,220	1,022,470	2,179,000	6,603,690
2008 – 2010	2,630,940	708,690	1,122,000	4,461,630
Total Cost	11,818,900	3,526,490	8,653,000	23,998,390

Biennium	TMDL Contract	Implementation Plan Contract	Personnel Cost	Total Cost
2002	220,000	160,000	1,183,000	1,563,000
2002 – 2004	2,656,120	811,870	2,054,000	5,521,990
2004 – 2006	2,963,710	823,460	2,115,000	5,902,170
2006 – 2008	3,402,220	1,022,470	2,179,000	6,603,690
2008 – 2010	2,668,440	746,190	1,122,000	4,536,630
Total Cost	11,910,490	3,563,990	8,653,000	24,127,480

Table III-3
Department Of Conservation and Recreation Costs (\$)

Biennium	TMDL Contract	Implementation Plan Contract	Personnel Cost	Total Cost
2002	1,302,330	600,280	1,155,000	3,057,610
2002 – 2004	2,602,030	811,870	3,080,000	6,493,900
2004 – 2006	2,963,710	823,460	3,740,000	7,527,170
2006 – 2008	3,402,220	1,022,470	4,070,000	8,494,690
2008 – 2010	2,630,940	708,690	4,070,000	7,409,630
Total Cost	12,901,230	3,966,770	16,115,000	32,983,000

Biennium	TMDL Contract	Implementation Plan Contract	Personnel Cost	Total Cost
2002	1,302,330	600,280	1,155,000	3,057,610
2002 – 2004	2,656,120	811,870	3,080,000	6,547,990
2004 – 2006	2,963,710	823,460	3,740,000	7,527,170
2006 – 2008	3,402,220	1,022,470	4,070,000	8,494,690
2008 – 2010	2,668,440	746,190	4,070,000	7,484,630
Total Cost	12,992,820	4,004,270	16,115,000	33,112,090

Table III-4

Department Of Mines, Minerals, and Energy Costs (\$)

Biennium	TMDL Contract	Implementation Plan Contract	Personnel Cost	Total Cost
2002	224,000	40,000	0	264,000
2002 – 2004	327,000	40,000	0	367,000
2004 – 2006	531,000	80,000	0	611,000
2006 – 2008	340,000	40,000	0	380,000
2008 – 2010	400,000	60,000	0	460,000
Total Cost	1,822,000	260,000	0	2,082,000

Biennium	TMDL Contract	Implementation Plan Contract	Personnel Cost	Total Cost
2002	224,000	40,000	0	264,000
2002 – 2004	327,000	40,000	0	367,000
2004 – 2006	531,000	80,000	0	611,000
2006 – 2008	340,000	40,000	0	380,000
2008 – 2010	400,000	60,000	0	460,000
Total Cost	1,822,000	260,000	0	2,082,000

Costs To Implement TMDLs

Estimating the total cost of implementation for the TMDL program is very difficult. The development of detailed TMDL Implementation Plans, which will include cost estimates for implementation, has only recently been initiated in those watersheds where TMDLs have been completed. Preliminary cost estimates range from \$400,000 to \$800,000 per watershed. These estimates include stakeholder and state agency costs. Cost varies depending on the size of the watershed and the intensity of the land use. Assuming that there are 388 TMDLs (295 from **Appendix C**, plus 18 from EPA additions, plus 75 expected to be added in 2002) in which implementation will be required, the overall implementation cost could be in a range of \$150 million to \$300 million. This does not include the cost of implementation for TMDLs that have to be developed in shellfish areas.

The preliminary cost estimates that have been completed to date reflect only watersheds that are impaired by fecal coliform bacteria where the primary land use is agriculture. Costs for implementation in urban watersheds, watersheds with substantial contributions from septic systems, and watersheds impacted by mining may be much higher. Costs for watersheds with multiple impairments will also be higher, for although some best management practices will reduce more than one pollutant, others will not. Costs have also not been projected for impairments that are likely to be added beyond 2002.

Cost estimates to remove the Chesapeake Bay and its tidal rivers from the impaired water list are also preliminary. The current estimate to implement the existing Chesapeake Bay Tributary Strategies is approximately \$275 million dollars in state funds (assuming the Virginia Water Quality Improvement Fund was used to cost-share the costs). Under the 2000 Chesapeake Bay Agreement, the Tributary Strategies will need to be revised in order to achieve the water quality standards for the Bay and its tidal rivers. The revised Tributary Strategies will most likely be more costly to implement, but the amount of the increase is unknown at this time.

Section Four – Funding Sources and Alternatives

Current Funding Sources

The 3 principal participating agencies currently have funding sources dedicated to the TMDL development process. This includes federal funding from EPA under sections 106, 104(b)(3), 604(b) and 319 of the Clean Water Act. Also, some funding has been provided from the state's general fund. The following tables present the funding sources, the amounts included in the current budget cycle, and projected federal funding for future biennia. Table IV-1 presents the current estimates for funding to support the TMDL program among all three agencies.

**Table IV-1
Current Funding Sources**

Biennium	Federal Funds	General Funds	Total Funds
2002	1,889,500	1,538,000	3,427,500
2002 – 2004	3,699,000	0	3,699,000
2004 – 2006	3,699,000	0	3,699,000
2006 – 2008	3,699,000	0	3,699,000
2008 – 2010	3,699,000	0	3,699,000
Totals	16,685,500	1,538,000	18,223,500

Biennium	Federal funds	General Funds	Total Funds
2002	1,889,500	1,538,000	3,427,500
2002 – 2004	3,699,000	0	3,699,000
2004 – 2006	3,699,000	0	3,699,000
2006 – 2008	3,699,000	0	3,699,000
2008 – 2010	3,699,000	0	3,699,000
Totals	16,685,500	1,538,000	18,223,500

Tables IV-2, IV-3, and IV-4 present the funding sources for each agency:

1. Department Of Environmental Quality

The current biennium budget provides DEQ with an additional \$1.01 million from the 106 grant program for the TMDL process.

EPA's 104(b)(3) Federal Water Quality Cooperative Agreement Grant Program contains about \$50,000 per annum. These funds are non-competitive and require no match. The entirety of this grant has been dedicated to the TMDL program for the last two years.

EPA's 604(b) Federal Water Quality Management Planning Grant contains about \$134,437 per annum. This grant program has a 40% pass through requirement to Virginia Planning District Commissions and a 25% match requirement from the PDCs. The entirety of this grant has been dedicated to the TMDL program for the last two years.

The current biennium budget provides \$300,000 in the general fund (FY 2001) to support 3 FTEs and contract services. No funding is provided in 2002.

No funding is provided for the TMDL development process through the Virginia Water Quality Improvement Fund (WQIF). All WQIF funds are dedicated to nutrient reduction at wastewater treatment plants to implement Virginia's Chesapeake Bay Nutrient Reduction Strategies. These efforts will help meet the goal of the 2000 Bay Agreement to de-list the Bay by 2010 and before a TMDL needs to be developed.

Table IV-2
Department Of Environmental Quality Funds (\$)

Biennium	CWA – 106	CWA – 104(b)(3)	CWA – 604(b)	General Fund	Total Funds
2002	1,010,000	50,000	134,500	300,000	1,494,500
2002 – 2004	2,020,000	100,000	269,000	0	2,389,000
2004 – 2006	2,020,000	100,000	269,000	0	2,389,000
2006 – 2008	2,020,000	100,000	269,000	0	2,389,000
2008 – 2010	2,020,000	100,000	269,000	0	2,389,000
Total Funds	9,090,000	450,000	1,210,500	300,000	11,050,500

Biennium	CWA – 106	CWA – 104(b)(3)	CWA – 604(b)	General Fund	Total Funds
2002*	1,010,000	50,000	134,500	300,000	1,494,500
2002 – 2004	2,020,000	100,000	269,000	0	2,389,000
2004 – 2006	2,020,000	100,000	269,000	0	2,389,000
2006 – 2008	2,020,000	100,000	269,000	0	2,389,000
2008 – 2010	2,020,000	100,000	269,000	0	2,389,000
Total Funds	9,090,000	450,000	1,210,500	300,000	11,050,500

2. Department Of Conservation and Recreation

The current biennium budget provides \$190,107 for FTEs and \$428,978 for contractual services in the general fund (FY 01 and 02).

EPA's 319 grant funding for TMDL development in 2000 and 2001 is about \$1,310,000 per biennium and is assumed to continue at the same level through 2010. The contractual funds available for the 2002 biennium are \$655,000. Also, the 319 grant provides about \$1,600,000 to be used only for implementation of TMDLs in 2000-2002. The implementation grant is to be received in July of 2001. Also, Water Quality Improvement Act funding will be utilized in the future for implementation funding where impairments are appropriately addressed under the purpose of the Act.

Table IV-3
Department Of Conservation and Recreation Funds (\$)

Biennium	CWA – 319	General Fund	Total Funds
2002	655,000	1,238,000	1,893,000
2002 – 2004	1,310,000	0	1,310,000
2004 – 2006	1,310,000	0	1,310,000
2006 – 2008	1,310,000	0	1,310,000
2008 – 2010	1,310,000	0	1,310,000
Total Funds	5,895,000	1,238,000	7,133,000

Biennium	CWA – 319	General Fund	Total Funds
2002	655,000	1,238,000	1,893,000
2002 – 2004	1,310,000	0	1,310,000
2004 – 2006	1,310,000	0	1,310,000
2006 – 2008	1,310,000	0	1,310,000
2008 – 2010	1,310,000	0	1,310,000
Total Funds	5,895,000	1,238,000	7,133,000

3. Department Of Mines, Minerals, and Energy

DMME received \$40,000 from EPA's 104(b)(3) Federal Water Quality Cooperative Agreement Grant Program to support TMDL development. This award is not expected on an annual basis.

Table IV-4
Department Of Mines, Minerals, and Energy Funds (\$)

Biennium 2002	CWA-104(b)(3) 40,000
2002 – 2004	
2004 – 2006	
2006 – 2008	
2008 – 2010	
Total Funds	40,000

Biennium 2002	CWA-104(b)(3) 40,000
2002 – 2004	
2004 – 2006	
2006 – 2008	
2008 – 2010	
Total Funds	40,000

Comparison of Costs and Available Funding

Table IV-5 presents the projected costs for developing TMDLs during each two year period through 2010 for comparison with the funds that are projected to be available. The difference is the projected deficit in each two-year period if no additional funds are provided to the TMDL program. The total deficit over the decade for developing TMDLs is currently estimated to be over \$40.8 million. This is a significant amount that may subtract funds from other environmental programs, including funds necessary to implement TMDLs (e.g., grants or loans).

Also, Table IV-5 shows that projected funding is less than 31% of the projected costs of developing TMDLs and TMDL Implementation Plans. This means the Commonwealth must provide almost 70% of the funding for the program. The projected federal contribution is not adequate. DEQ recommends that the Governor and General Assembly aggressively promote a higher contribution, at least 50%, from the federal government for the TMDL program.

Table IV-5
Comparison of TMDL Process Costs, Available Funds, and Deficit (\$)

Biennium	Costs	Funds	Deficit
2002	4,884,610	3,427,500	1,457,110
2002 – 2004	12,328,800	3,699,000	8,629,800
2004 – 2006	14,040,340	3,699,000	10,341,340
2006 – 2008	15,478,380	3,699,000	11,779,380
2008 – 2010	12,331,260	3,699,000	8,632,260
Totals	59,063,390	18,223,500	40,839,890

Biennium	Costs	Funds	Deficit
2002	4,884,610	3,427,500	1,457,110
2002 – 2004	12,436,980	3,699,000	8,737,980
2004 – 2006	14,040,340	3,699,000	10,341,340
2006 – 2008	15,478,380	3,699,000	11,779,380
2008 – 2010	12,481,260	3,699,000	8,782,260
Totals	59,321,570	18,223,500	41,098,070

Note: Table IV-5 does not include costs for shellfish TMDLs or implementation

The combined biennium budget amendments submitted by DEQ and DCR exceed the 2002 biennium deficit shown in Table IV-5. With increasing number of TMDLs required in each biennium and the extensive public participation DEQ holds for the stakeholders, a number of TMDLs scheduled for completion in 2004 must be contracted and started in 2001. Starting some of the TMDLs early and distributing the workload over longer period of time is necessary for meeting the schedule.

Options for Financing and Administering the TMDL Program

Currently the Commonwealth is contracting for all TMDL modeling and development. Preliminary cost estimates show there is not a significant cost savings by increasing staff and developing the TMDLs in-house. However, there are benefits of doing the TMDLs in-house. As DEQ, DCR, and DMME gain experience in developing TMDLs, it may become beneficial to divide the development workload between in-house development and outside contracting. Some options discussed by the stakeholder group are included below.

1. An option to help in financing the TMDL program is to cost-share TMDL development with stakeholders who are willing to pay a portion of the costs. Local governments, industry, or citizen groups may be willing to finance part of the costs for certain TMDLs. Citizens may not want to wait until the date when a TMDL for an impaired water in their watershed is scheduled for development. In these cases DEQ would still be the lead in developing the TMDL, submitting it to EPA and the State Water Control Board for approval.
2. The Interstate Commission on the Potomac River Basin (ICPRB) receives grant money from EPA under §106 of the Clean Water Act. This money is to be used, in part, to fund TMDL development in the Potomac River Basin states. Based upon the amount of funding received by ICPRB, Virginia anticipates ICPRB funding for the development of one to two TMDLs per year in the Potomac River Basin.
3. VDEQ and the other state agencies involved will continue to seek innovative sources of funding. For example, under VDEQ's enforcement program, it may be appropriate to use Supplemental Environmental Projects (SEPs) to fund development of TMDLs, Implementation Plans and the installation of pollution controls associated with TMDLs. SEPs can be used in settling civil or administrative penalties, to pay for environmentally beneficial projects in the immediate geographical area of the facility being assessed the penalty.
4. If DEQ and the participating state agencies receive partial funding for meeting the requirements of the TMDL schedule in the Consent Decree, EPA will assume responsibility for TMDL development to ensure the Consent Decree schedule is met. This would mean that the Commonwealth would develop TMDLs for some of the impaired waters and EPA will develop TMDLs for the remaining segments in order to meet the Consent Decree schedule. The level of federal funding would most likely be impacted under this option.
5. If the Commonwealth decides not to implement the TMDL program, then EPA will take the leadership role in the program. In a federalized program, the Commonwealth would give up management control and would give up its key decision making role in the pollutant loading

allocation and remediation scenarios. The Commonwealth's role in the decision making process would be greatly reduced. West Virginia has taken that approach and has had to accept TMDLs that lack technical depth, and that clearly do not meet that State's stakeholder needs for developing realistic Implementation Plans. Staff understands that West Virginia is taking steps to assume the leadership role for the TMDL program in their state.

If Virginia cedes the TMDL program to EPA, most, if not all of the federally funded water program grants would be eliminated, or, at best, be significantly reduced. Also, significant program and fiscal sanctions would be imposed on any remaining funds. All water programs would suffer as a result. Of additional concern, would be the reduced level of technical input by the Commonwealth, and the reduction of public participation and input from Virginia's local stakeholders. The currently successful collaborative approach between State agencies, EPA, and local stakeholders would severely diminish. A significant number of additional FTEs would still be required, at a lower level than if Virginia maintains the TMDL program, to provide the interface with EPA and to implement TMDLs at the local level.

Section Five – Framework for Pollution Reduction

TMDLs provide the framework for the pollution reductions needed to bring a water body back into compliance with water quality standards. The pollution reductions are expressed as percent reductions necessary in existing pollutant loads. Often, there are multiple categories of pollutant sources for each pollutant. Bacteria, for example, can come from many sources, both point and non-point in origin. Bacteria can come from agricultural sources like run-off from feedlots and pastures, manure spread on fields, and unfenced grazing areas. But bacteria can also originate from failing septic systems, illegal discharges of wastewater from homes, sewer pipe overflows, and even legally from permitted discharges like municipal sewage treatment plants. (In the last example, however, the concentrations of bacteria are strictly limited by permit conditions that require disinfection of wastewater prior to discharge.) Much of the work in developing a “fecal coliform bacteria TMDL” involves using advanced DNA technology to help calculate the percentage of the bacteria loading contributed by each category of sources listed above, and developing an equitable, cost-effective solution.

Determining Responsibility

Public participation is a critical part of the TMDL development process. As the TMDL for a watershed is developed, results of the study will be shared with stakeholders living in the watershed at a series of formal and informal meetings. Results will include a breakdown of the pollutant loading, by category, for the particular pollutant in question. Usually, the results will include recommended percent reductions of pollutants from the different categories of sources to achieve compliance with water quality standards. These non-binding recommendations are made in consideration of the effectiveness of available pollution control technologies versus costs of pollution control measures. While this cost-benefit approach is useful, the stakeholders have an important voice in the choice of implementation strategies. Also, the regulatory framework behind control measures must be considered. Finally, cost-sharing and funding sources are important considerations in choosing the appropriate “mix” of pollution control strategies for a particular watershed.

Equity

Implementation of pollution controls can be expensive. Issues of equity arise in determining what segments of the community will bear the costs of achieving pollution reductions. For the bacteria example given above, illegal pollution sources, such as the illegal discharge of untreated wastewater from a home, needs to be corrected, usually at the homeowner's expense. Leaking sewer pipes are also illegal and must be repaired at the expense of the owner of the system (usually a public entity such as a county, municipality or sewage authority). The Agriculture Stewardship Act provides a mechanism for dealing with agricultural violations. However, for most nonpoint sources, such as pasture run-off, pollution controls are voluntary and incentive-based. Costs for fencing animals away from the stream, providing an alternative water supply and establishing vegetated buffer strips, etc. must be borne by the individual farmers. Fortunately, cost-share and tax incentives are available for the farmers, but once the initial capital costs are incurred, cost of long-term maintenance and repair falls to the farmer/landowner.

A key factor in the equity issue is that point sources are administratively easier to control than non-point sources, so most of the burden of pollution reductions in the past have fallen on the point sources. However, point sources must continue to do their part and have sources of revenue to pay for improvements in pollution control. In the case of industry, pollution control costs are part of the costs of doing business and are included in the pricing of the product. Municipalities and sewage authorities have ratepayers and taxpayers, so costs are passed on by this sector. Furthermore, municipalities have access to many subsidies in the form of no-

interest or low-interest loans and outright grants from the state and federal government, so their capital costs are subsidized by taxpayers-at-large outside of their jurisdiction.

For the farming sector, certain economic and assistance programs are emerging, such as the availability of loans from the Virginia Revolving Loan Fund for certain practices in addition to DCR/NRCS's existing suite of cost-share and tax incentive programs. Farms in Virginia are in general, relatively small operations in a very competitive (global) market, and lack the ability to pass on costs of pollution control measures the way many other businesses do.

Matrix Approach

Often, there is more than one viable way to achieve pollution reductions and restore water quality. In these cases the input of the stakeholders in the watershed at public meetings is especially important. For the TMDL program, Virginia pioneered the "matrix of options" approach with EPA. In this approach, Virginia presents EPA with a matrix of viable pollution reduction options. The percent reduction from the various point and non-point source allocations could be varied but still achieve the desired results of the TMDL. Each scenario, if followed, would result in attainment of water quality standards. The matrix shown in Table V-1 is taken from a TMDL for an impaired stream where the nitrate levels in a drinking water segment exceeded the water quality standard of 10 mg/l. This table shows that tradeoffs in the reduction of pollutant loads from different categories of non-point sources are possible, as well as tradeoffs between point and non-point sources to reduce the nitrate concentrates to levels below the standard.

Table V-1
Sample TMDL Allocation Options
(Allocations in Percent Reductions)

Scenario No.	Point Source #1	Crop	Hay	Pasture	Loafing Lots	* Peak Nitrate Drinking Water Segment (mg/l)
1	20	40	40	40	50	9.47
2	20	46	40	40	50	9.50
3	30	40	40	40	40	9.50
4	35	25	30	20	50	9.46
5	35	27	30	20	50	9.49
6	45	35	25	30	50	9.46
7	50	25	25	25	25	9.50

* Nitrate concentrations in the stream cannot exceed 9.50 mg/l and meet the water quality standard for drinking water segments plus the explicit margin of safety of 0.5 mg/l for the TMDL.

A preferred scenario must be picked by the stakeholders and identified in the TMDL. In the above allocation matrix, the stakeholders picked scenario number 4. By approving the matrix of options, EPA gives the State, local governments and the watershed's stakeholders flexibility to design and implement a pollution control plan tailored to the individual needs of each watershed. During development of the Implementation Plan or during implementation of the reductions, if one of the other scenarios in the TMDL matrix emerges as a better allocation, DEQ can change the original preferred option to another option in the matrix by notifying EPA of the change.

Phased Implementation

“Phased implementation” means that the most cost-effective methods of pollution control are applied first. As these measures take effect, continued water quality monitoring in the watershed documents the improvement in water quality. In many cases, it is expected that water quality goals can be achieved short of applying more costly measures. This approach will also allow the tracking of “cross benefits” of measures to control one pollutant on reductions of another pollutant. For example, measures to control bacteria run-off from agricultural sources will also reduce nitrate levels in a watershed. Measures taken to control either bacteria run-off or nitrate run-off should improve water quality for the support of aquatic life as measured by biological monitoring [sampling of benthic macro-invertebrates].

Section Six - Future Issues and Options Impacting TMDL Program

This section describes ongoing actions at the state and federal level that will have a significant impact on the TMDL program in Virginia. These actions include: (1) development of a state regulation for TMDL Planning; (2) revisions to the federal TMDL regulations recently adopted by EPA; (3) possible actions in Congress on federal TMDL legislation; (4) several changes to the state Water Quality Standards regulation (9 VAC 25-260-5 et seq.) that would have a direct impact on the list of impaired waters and TMDL program; and (5) pollutant trading. These actions can have a significant impact on the cost and revenue projections contained in this report.

Proposed Virginia TMDL Planning Regulation

DEQ has recently initiated a rulemaking proposing the development of a TMDL Planning regulation. It will include, the public participation process for TMDL development, procedures for submittal of proposed TMDLs to the Environmental Protection Agency for approval, subsequent adoption of the TMDL by the SWCB, and inclusion of TMDLs and TMDL Implementation Plans into the states' Water Quality Management Plans. This TMDL planning regulation will assist DEQ in implementing the program although the agency has full authorization to implement the TMDL program under existing state law.

The secondary proposed action in the rulemaking is the repeal of the existing WQMPs. These plans are basinwide or areawide waste treatment or pollution control management plans developed in accordance with sections 208 and 303(e) of the Clean Water Act, as implemented by 40 CFR 130. These plans identify water quality problems, consider alternative solutions and recommend pollution control measures needed to attain or maintain water quality standards. The control measures are implemented through the issuance of Virginia Pollutant Discharge Elimination System (VPDES) permits for point source discharges and through regulatory or voluntary measures for nonpoint source pollution control. The majority of the existing regulatory plans are obsolete because plan recommendations have been implemented. They continue to be carried on the books of the Virginia Registrar of Regulations. The repeal of these plans will clear the Registrar's books of unnecessary and outdated regulations and will eliminate the potential for inconsistencies with TMDLs as they are developed from more current information and collaborative input from stakeholders.

Impact of EPA's New TMDL Regulations

On July 11, 2000 EPA issued revisions to the federal Water Quality Management Planning and Management Regulation, as well as to the NPDES permit regulations. The revisions to each related primarily to the TMDL program. These new rules are not effective until November 1, 2001, so until that time the existing federal regulations are still in effect. Based on actions by Congress and the President, EPA is prohibited from discussing the new regulations or developing guidance on their implementation until after October 1, 2001. Therefore, while it is not clear what the exact impact these new rules will have on Virginia's TMDL Program over the next decade, several effects can be anticipated.

First, states will have to submit a 303(d) list of impaired waters every four years, instead of every two. The next list is due in April 2002, with subsequent lists due in 2006 and 2010.

Second, the new rules provide some additional flexibility to the states for completing TMDLs for the waters on their 303(d) lists. States must establish TMDLs for all waters on their lists by July 2010, although the schedule for one or more TMDLs may be extended by no more than five additional years for good cause. Unfortunately, this additional flexibility is not available to Virginia since EPA is operating under the Consent Decree schedule (described previously in

Section Two). EPA will have to successfully petition the federal court to allow any deviation from the court ordered schedule.

Third, the new rules require the states to submit an individual TMDL not later than the end of the one year period during which it was scheduled. If this does not occur, EPA must establish the TMDL within two years; and the Administrator may extend this period for another two years. These schedules also do not apply in Virginia because of the Consent Decree. Under the Consent Decree, EPA must establish the TMDL within one year if the state does not meet its scheduled completion date.

The major impacts from the new rules are expected to be the broader role EPA will have in implementing the TMDL program. This broader role is anticipated since the new rule expands the definition of a TMDL. Under the current rule, a TMDL is considered to be the amount of a pollutant a waterbody can receive and still meet water quality standards. In regulatory terms, it is defined as the sum of the Waste Load Allocations for point sources and Load Allocations for nonpoint sources. Under the new rule, a TMDL is defined as a written quantitative plan and analysis for attaining and maintaining water quality standards in all seasons for a specific waterbody and pollutant. The TMDL must contain eleven elements, including an allowance for reasonable growth and an Implementation Plan. Under the new rules, EPA's authority in the TMDL program will expand because EPA will approve the more broadly defined TMDL.

Under the current federal regulations, a TMDL is not required to include an Implementation Plan. Therefore, under the current program, TMDLs submitted to EPA by the Commonwealth do not include an Implementation Plan. In accordance with the Code of Virginia (§62.1-44.19:7) the "[State Water Control] Board shall develop and implement a plan to achieve fully supporting status for impaired waters...". Therefore, under the current program Virginia only develops an Implementation Plan after EPA approves the TMDL.

EPA's final rule states that the Implementation Plan is not expected to be a complex, lengthy document. However, the issue is not the document itself but the time needed to work with affected stakeholders to develop specific allocations among the point and nonpoint sources in the watershed that would comprise the Implementation Plan.

The TMDLs developed to date have led to much debate and controversy over equity and costs among stakeholders, even at the more generic level of making waste load allocations ("WLAs") and load allocations ("LA") as required under the existing TMDL regulations. Making the Implementation Plan part of the TMDL will call for more specific decisions about the types and number of actions each stakeholder will need to take, thereby escalating the interest, concern and comment on each TMDL. EPA's final rule does call upon the States to publish each TMDL for a 30-day public review prior to its submission to EPA for approval. However, it is anticipated that the public participation in the expanded TMDL process will require considerable more time to work out an Implementation Plan that will be supported by the public.

Impact of New Federal Legislation

Due to the controversy over EPA's newly promulgated TMDL regulations, a number of bills have been introduced in Congress that would revise the TMDL program in various ways. DEQ staff will monitor the progress of these bills to determine the potential impact any may have on the future of the TMDL program.

EPA Nutrient Criteria and DEQ Nutrient Water Quality Standards

The EPA has presented a National strategy for developing nutrient criteria. This strategy was developed in response to the Clinton Administration's Clean Water Action Plan that calls for the development of regional nutrient criteria (nitrogen and phosphorus). The major focus of this

strategy is the development of water-type technical guidance and region-specific nutrient criteria by the year 2000. The waters being considered are lakes, rivers and estuaries. Once water-type guidance and nutrient criteria are established, EPA expects the States to adopt these numerical nutrient criteria into state water quality standards by the end of 2003. Currently, the Chesapeake Bay Program Office is working with the states and their counterparts at EPA Region 3 to develop Chesapeake Bay specific criteria for nutrient indicators (chlorophyll a, dissolved oxygen and turbidity), rather than the causative agents (nitrogen and phosphorus).

Once the nutrient, or nutrient related, criteria are adopted as standards, the assessments conducted for the 305(b) report and 303(d) list will compare water quality data with these standards to determine whether additional waters should be classified as impaired. Since no waters are currently assessed as impaired specifically for nutrients, it is anticipated that the number of impaired waters will increase in the state due to these nutrient standards. However, it is likely that many waters in agricultural areas currently impaired for fecal coliform will also be impaired for nutrients.

Under these new standards DEQ will need to determine whether VPDES permitted discharges have the reasonable potential to cause or contribute to the exceedence of the numerical nutrient criteria. This could mean that many sewage treatment plants must install biological nutrient removal. Some treatment plants may require even higher levels of treatment to reduce nutrient inputs to the environment, depending on the size of the water and the criteria concentrations that are adopted as water quality standards. There are many sewage treatment plants in Virginia that currently have phosphorus removal technologies. These plants are located in waters designated as "nutrient enriched" and would therefore, fall under a companion regulation to the water quality standards called the Nutrient Policy. The nutrient policy requires discharges of 1 MGD or greater to remove phosphorus to 2 mg/L if they discharge into waters designated as "nutrient enriched". The necessity of this policy may need to be evaluated if Virginia adopts statewide nutrient criteria.

Bacteria Water Quality Standard and Alternate Indicator Species

The most common cause for listing water segments as impaired is violation of the state Water Quality Standard for fecal coliform bacteria. However, at EPA's recommendation, the DEQ has asked the Department of Planning and Budget for approval to publish a notice of intended regulatory action ("NOIRA") on the subject of alternate bacterial indicator species. Publication of this notice is expected in the fall of 2000 with language drafted for comment by mid-2001. These alternate bacteria are better indicators of the risk of contracting gastroenteritis from fecal contaminated waters. The indicators recommended are enterococci and *E. coli*. These are present in the fecal waste of all warm blooded animals and are intended to be applied to bathing beaches (primary contact recreation). Preliminary data in surface waters of Virginia show that the water quality criteria recommended for the new indicators are exceeded as often or more often than the fecal coliform criterion. This analysis was done using the most stringent enterococci and *E. coli* criteria for primary contact recreational waters. From this preliminary analysis, it seems possible that the number of impaired waters will increase if the alternate bacterial indicators replace fecal coliforms.

Along with the consideration of the new alternate indicators, enterococci and *E. coli*, there is a concern associated with the existing fecal coliform criterion. EPA has verbally announced that if DEQ elects to keep a fecal coliform criterion in addition to the new indicators, then the existing 1000/100 maximum criteria must be replaced by EPA's maximum fecal coliform criteria. This EPA maximum is that not more than 10% of the total samples collected in a 30-day period shall exceed 400/100 ml. This would most likely cause more waters to be placed on the 303(d) list since DEQ does not collect more than one sample per month.

Primary and Secondary Contact Waters for Swimming Use

In the 1960's and early 1970's the State Water Control Board had primary and secondary recreational uses for state waters. Each of these recreational uses had different fecal coliform criteria to protect those uses (e.g. higher fecal coliform levels were allowed in secondary contact waters). In the early 1980's the agency decided to designate all waters for primary contact recreation. Disinfection to meet the 200/100 ml is currently implemented in all point source sewage effluents statewide. As the 303(d) list of impaired waters gained importance to the non-point users of a water body, this use designation has undergone scrutiny.

Therefore, as part of the same NOIRA mentioned above, DEQ has also asked for approval to reconsider changing the primary use designations. This may mean some streams could be more appropriately designated as secondary and others may be designated at different "levels" of primary contact recreation (for example, seasonal uses). Other "levels" of primary contact are listed in EPA's 1986 Ambient Bacteria Criteria and include a range of uses from "Designated Bathing Beach" to "Infrequent Used Full Body Primary Contact". If some waters were designated at a use other than "Bathing Beach" then the bacteria criterion would become less stringent. This means that some waters may be removed from the impaired water list or the achievement of the appropriate bacterial quality would be less challenging. To change a recreational use from primary to secondary requires a use attainability analysis ("UAA"). A UAA is a structured scientific assessment of the physical, chemical and biological factors that affect the attainment of the use. These UAA's must be conducted on a stream by stream basis and can be difficult and time consuming.

Benthic TMDLs

For more than two decades DEQ has maintained a statewide biological monitoring program for freshwater, wadeable streams that utilizes macroinvertebrates as indicators of water quality impairment. EPA now requires the Commonwealth to list waters on the 303(d) list for which biological assessments indicate severe biological use impairment. Then a benthic TMDL is required for remediating the biological use impairment.

There are several concerns expressed by some stakeholders about the use of these data in listing waters on the 303(d) list as well as how benthic TMDLs are developed. DEQ has identified and is exploring several actions/measures to address these concerns and to improve the scientific defensibility of Virginia's biomonitoring methods.

The Commonwealth, as required by EPA, has a narrative biological integrity statement in the water quality standards regulation and is working, with the assistance of EPA, toward the federal Clean Water Action plan goal of numeric biocriteria by 2005. Despite criticism from some stakeholders, EPA requires the Commonwealth to base biological use impairment decisions/determinations on the current narrative regulatory statement rather than deferring the use of this type of assessment until such time as regulatory numeric criteria are in place. Some stakeholders also question whether these assessments undergo adequate quality control prior to the waterbody in question being placed on the 305(b) list for biological use impairment. There is also the issue of the Commonwealth having to compare urban and agricultural streams to a range of established regional, minimally impaired, reference conditions when there is little likelihood that this use is attainable. In these situations the issue is actually that the Commonwealth's water quality standards do not delineate use classes that recognize these waters, e.g., urban streams do not support the same aquatic life use found in non-urbanized, unimpacted streams in that area of the Commonwealth.

Biological monitoring is a good indicator of the biological health of a stream community, but it identifies the effect of pollution rather than the cause. Additional studies are necessary to identify sources of the biological impairment before a benthic TMDL can be developed.

DEQ is approaching the benthic TMDL issue on three fronts:

1. Make refinements to the assessment methodology and quality assurance to ensure the validity of the data that causes a water to be placed on the 303(d) list in the first place;
2. Pursue development of numeric biocriteria for inclusion in the Virginia Water Quality Standards; and,
3. Pursue use removals in accordance with regulatory procedures where use attainability studies demonstrate appropriateness of such an action.

Pollutant Trading

An implementation mechanism that may help achieve TMDL goals more cost effectively is pollutant trading. Once a TMDL establishes the waste load allocations for point sources and load allocations for nonpoint sources, the emphasis shifts towards how these allocations will be implemented. As implementation actions proceed within a watershed, pollutant-trading opportunities may arise.

Trading programs are emerging in a variety of locations nationwide as a means to achieve pollutant reductions in cost-effective and environmentally sound ways. In simple terms, trading programs provide a mechanism for determining the most cost-effective means of pollution reduction via the process of buying and selling pollution reduction credits. Through this program, the seller of the credits provides cost-effective means of removing or preventing additional pollutant discharges and the buyer of the credits has access to these more affordable means. Central to this kind of system is that overall pollution load is not increased within a particular area. The total pollution control requirements in an area such as a watershed or subbasin will be met, but the aggregate cost of compliance across nutrient sources is reduced.

EPA promotes pollutant trading as an innovative way for community stakeholders to develop more "common sense" solutions to water quality problems in their watersheds. According to U.S. EPA's Effluent Trading in Watersheds Policy Statement, trading potentially offers a number of economic, environmental, and social benefits, including: (1) achieving equal to or greater reduction of pollution for the same or less cost; (2) encouraging dialogue among stakeholders; and, (3) fostering concerted and holistic solutions for watersheds with multiple sources of water quality impairment.

Pollutant trading is being actively considered through the interstate Chesapeake Bay Program. A Chesapeake Bay Program Nutrient Trading Guidance Document has been developed which includes eight fundamental principles viewed as essential to a successful and environmentally sound trading program. The document also contains recommended trading guidelines that will provide a consistent approach for the Chesapeake Bay Agreement jurisdictions to voluntarily develop, as they deem appropriate, state-specific nutrient trading programs. This document is not a regulation, but rather guidance that states can use on a voluntary basis to ensure that nutrient trading approaches in the Chesapeake Bay watershed are consistent and compatible among jurisdictions, and fully supportive of Chesapeake Bay Program goals.

Application of a trading program to pollutants other than nutrients and to impaired waters other than the Chesapeake Bay will require development of specific guidelines for these purposes.

Due to the innovative nature of pollutant trading and stakeholder interest in its proper application, development of a pollutant trading program will include a public participation process.

APPENDIX A

Text of Item 415.F.1 of the 2000 Appropriations Act

2000 Appropriations Act
Item 415

Department Of Environmental Quality

F.1. Included in the amounts for Environmental and Technical Assistance is \$300,000 the first year from the general fund for the Department to cooperate with the U.S. Environmental Protection Agency for the development, coordination, and implementation of the total maximum daily load program. The Departments of Environmental Quality and Conservation and Recreation, under the guidance of the Secretary of Natural Resources, shall establish an advisory committee of point and nonpoint source pollution control stakeholders. The Department shall develop a comprehensive plan for implementation of the total maximum daily load program through the year 2010. This plan shall include input from the advisory committee hereby established, and shall address the program's funding impacts and suggest means to pay for the program; develop alternative strategies to accomplish the program's aims; and propose a framework for affected stakeholders to determine responsibility for pollution reductions. The Department shall submit the plan to the Governor, the Chairmen of the House Committees on Appropriations and Conservation and Natural Resources, and the Chairmen of the Senate Committees on Finance and Agriculture, Conservation and Natural Resources by November 1, 2000.

Appendix B

Stakeholders Advisory Committee

TMDL STAKEHOLDER ADVISORY COMMITTEE MEMBERSHIP LIST

(7/6/00)

Water Resources Committee Members

- (1) Mr. Guy M. Aydlett
Representing Virginia Association of
Municipal Wastewater Agencies, Inc.
Hampton Roads Sanitation District
Director of Water Quality
P. O. Box 5902
Virginia Beach, Virginia 23471-0902
(TELEPHONE: 757/460-2261) (email: gaydlett@hrs.dst.va.us)
- (2) Mr. David G. Frackelton
Representing Virginia Agribusiness Council
Director of Environmental Affairs
Wampler Foods, Inc.
P. O. Box 346
Harrisonburg, Virginia 22801
(TELEPHONE: 540/564-6141) (email: envrment@wlrfoods.com)
- (3) Mr. Jay Gilliam
Izaak Walton League & VA Save Our Streams
7600 N. Lee Highway
Raphine, Virginia 24472
(TELEPHONE: 540/377-6179) (email: strmiwla@cfw.com)
- (4) Ms. Patricia A. Jackson, Executive Director
James River Association
P. O. Box 110
Richmond, Virginia 23218-0110
(TELEPHONE: 804/730-2898) (email: jra@i2020.net)
- (5) Mr. Tedd H. Jett, P.E., Environmental Engineering Manager
Representing Virginia Manufacturers Association
Merck & Co., Inc.
Post Office Box 7
Elkton, Virginia 22827
(TELEPHONE: 540/298-4869) (email: tedd_h_jett@merck.com)
- (6) Ms. Katherine E. Slaughter
Senior Attorney
Southern Environmental Law Center
201 W. Main Street, Suite 14
Charlottesville, Virginia 22902-5065
(TELEPHONE: 804/977-4090) (email: kslaughter@selcva.org)
- (7) Mr. Clayton L. Walton, Attorney
Representing the Virginia Chamber of Commerce
Williams, Mullen, Christian, Dobbins

P. O. Box 1320
Richmond, VA 23210-1320
(TELEPHONE: 804/783-6496) (email: [Clean Water Action@wmcd.com](mailto:CleanWaterAction@wmcd.com))

- (8) Mr. Paul Howe
Executive Vice President
Virginia Forestry Association
8810 Patterson Avenue
Richmond, VA
(TELEPHONE: 804/741-0836) (email: howep@erols.com)

Other Stakeholders

- (9) Ms. Frances Zaun
Virginia Farm Bureau
P. O. Box 27552
Richmond, Virginia 23261
(TELEPHONE: 804/290-1021) (email: fzaun@vafb.com)
- (10) Mr. Thomas V. Robertson
Representing the Chemical Manufacturers Association
E. I. DuPont de Nemours & Co., Inc.
Spruance Fibers
5401 Jefferson Davis Highway
Richmond, Virginia 23234
(TELEPHONE: 804/383-2129) (email: thomas.v.robertson-1@usa.dupont.com)
- (11) Mr. Christopher D. Pomeroy
Representing VAMWA
McGuire Woods Battle & Boothe LLP
One James Center
901 E. Cary Street
Richmond, VA 23219
(TELEPHONE: 804/775-1000) (email: cdpomero@mwbb.com)
- (12) Mr. Jeff Corbin
Chesapeake Bay Foundation
1001 E. Main Street, Suite 710
Richmond, Virginia 23219
(TELEPHONE: 804/780-1392) (email: jcorbin@cbf.org)
- (13) Ms. Marilyn W. Layer
Director
Tidewater Soil & Water Conservation District
Post Office Box 127
North, Virginia 23128
(TELEPHONE: 804/725-4622) (email: layer@inna.net)
- (14) Mr. James G. Byrne
Director
Culpeper Soil & Water Conservation District
604 South Main Street
Culpeper, VA 22701

(TELEPHONE: 540/825-8591) (email: tohisplace@juno.com)

State Agency Staff

- (15) Mr. Alan E. Pollock
Virginia Department of Environmental Quality
629 East Main Street, 6th Floor
Richmond, Virginia 23219
(TELEPHONE: 804/698-4002) (email: aepollock@deq.state.va.us)

- (16) Mr. Ron Gregory
Virginia Department of Environmental Quality
629 East Main Street, 9th Floor
Richmond, Virginia 23219
(TELEPHONE: 804/698-4471) (email: ragregory@deq.state.va.us)

- (17) Mr. Charles H. Martin
Virginia Department of Environmental Quality
629 East Main Street, 9th Floor
Richmond, Virginia 23219
(TELEPHONE: 804/698-4462) (email: chmartin@deq.state.va.us)

- (18) Mr. David S. Lazarus
Virginia Department of Environmental Quality
629 East Main Street, 9th Floor
Richmond, Virginia 23219
(TELEPHONE: 804/698-4299) (email: dslazarus@deq.state.va.us)

- (19) Mr. Stu Wilson
Virginia Department of Conservation & Recreation
109 Governor Street, 12th Floor
Madison Bldg.
Richmond, Virginia 23219
(TELEPHONE: 804/786-4382) (email: swilson@dcr.state.va.us)

- (20) Mr. Mark Bennett
Virginia Department of Conservation & Recreation
109 Governor Street, 12th Floor
Madison Bldg.
Richmond, Virginia 23219
(TELEPHONE: 804/371-7485) (email: mbennett@dcr.state.va.us)

- (21) Mr. George Joey O'Quinn
Reclamation Enforcement Asst. Manager
Department of Mines, Minerals, & Energy
Division of Mined Land Reclamation
Post Office Drawer 900
Big Stone Gap, Virginia 24219
(TELEPHONE: 540/523-8151) (email: gjo@mme.state.va.us)
- (22) Mr. Robert B. Taylor, PE
Director
Division of Water Supply Engineering
Virginia Department of Health
Main Street Station
1500 E. Main Street
Richmond, Virginia, 23219
(TELEPHONE: 804/786-1767) (email: rtaylor@vdh.state.va.us)
- (23) Mr. Randy Shank
Representing Virginia Extension Service
Virginia Department of Conservation & Recreation
109 Governor Street, 12th Floor
Madison Bldg.
Richmond, Virginia 23219
(TELEPHONE: 804/371-8884) (email: rshank@vt.edu)
- (24) Mr. Robert Wittman
Division of Shellfish Sanitation
1500 E. Main Street
Richmond, Virginia 23219
(TELEPHONE: 804/786-7937) (email: rwittman@vdh.state.va.us)

Appendix C

Schedule for Development of TMDLs through 2010

WBID1	ID	STREAM	WBCOUN1	WBBASIN	LENGTH	SQMI	UNIT	USE1	USE2	CAUSE	SOURCE	DUE
VAV-B21R	B21R	Muddy Creek/Dry River/North River	Rockingham Co., Town of Bridgewater	POTO/SHEN	7.04		Miles	DW		Nitrate	PS/NPS	1999
VAN-E09R	E09R	Mountain Run	Culpeper	RAPPAHANNOCK	7.58		Miles	SWIM		FC/BC*	UNK	2000
VAS-O05R	O05R	Cedar Creek	Washington	TENNESSEE/BS	5.24		Miles	SWIM		FC/BC*	NPS	2000
VAS-O05R	O05R	Hutton Creek	Washington	TENNESSEE/BS	4.2		Miles	SWIM		FC/BC*	NPS	2000
VAS-O05R	O05R	Byers Creek	Washington	TENNESSEE/BS	1.19		Miles	SWIM		FC/BC*	NPS	2000
VAS-O05R	O05R	Hall Creek	Washington	TENNESSEE/BS	5.87		Miles	SWIM		FC/BC*	NPS	2000
VAV-B21R	B21R	Dry River	Rockingham Co.	POTO/SHEN	6.47		Miles	SWIM		FC	NPS	2000
VAW-L08R	L08R	South Fork of the Blackwater River	Franklin	ROANOKE	6.05		Miles	SWIM		FC	NPS	2000
VAW-L23R	L23R	Sheeps Creek	Bedford	ROANOKE	7.33		Miles	SWIM		FC	NPS	2000
VAW-L25R	L25R	Elk Creek	Bedford	ROANOKE	7.48		Miles	SWIM		FC	NPS	2000
VAW-L26R	L26R	Machine Creek	Bedford	ROANOKE	20		Miles	SWIM		FC	NPS	2000
VAW-L26R	L26R	Little Otter River	Bedford	ROANOKE	27.22		Miles	SWIM		FC	NPS	2000
VAW-L28R	L28R	Big Otter River	Campbell	ROANOKE	14.75		Miles	SWIM		FC	NPS	2000
VAN-A02R	A02R	Catoctin Creek	Loudoun	POTO/SHEN	7.4		Miles	SWIM		FC	UNK	2002
VAN-A02R	A02R	North Fork Catoctin Creek	Loudoun	POTO/SHEN	10.53		Miles	SWIM		FC	UNK	2002
VAN-A02R	A02R	South Fork Catoctin Creek	Loudoun	POTO/SHEN	6.01		Miles	SWIM		FC	UNK	2002
VAN-A12R	A12R	Four Mile Run	Arlington County, Alexandria City	POTO/SHEN	8		Miles	SWIM		FC	UNK	2002
VAN-A15R	A15R	Accotink Creek	Fairfax	POTO/SHEN	4.5		Miles	SWIM		FC	UNK	2002
VAN-E01R	E01R	Thumb Run	Fauquier	RAPPAHANNOCK	7.41		Miles	SWIM		FC	UNK	2002
VAP-H36R	H36R	Willis River	Cumberland	JAMES	14.3		Miles	SWIM		FC	UNK	2002
VAS-O07R	O07R	Little Creek	Washington, City of Bristol	TENNESSEE/BS	5.52		Miles	SWIM		FC	NPS	2002
VAS-P11R	P11R	Guest R.,Crab Orch.Ck,Sepulcher Ck.,Yellow Ck,Tom,Lit.Tom Ck	Wise	TENNESSEE/BS	46.15		Miles	SWIM		FC	NPS	2002
VAS-P17R	P17R	Black Creek and tributaries	Wise	TENNESSEE/BS	5.94		Miles	ALUS		BC	MINE	2002
VAS-P20R	P20R	Straight Creek, Stone Creek and tributaries	Lee	TENNESSEE/BS	38.1		Miles	ALUS		BC	MINE	2002
VAV-B10R	B10R	Cockran Spring	Augusta Co.	POTO/SHEN	0.8		Miles	ALUS		BC	PS	2002
VAV-B14R	B14R	Christians Creek	Augusta Co.	POTO/SHEN	31.52		Miles	SWIM	ALUS	FC**/BC	NPS	2002
VAV-B19R	B19R	Mossy Creek	Rockingham Co.	POTO/SHEN	10.14		Miles	SWIM		FC	NPS	2002
VAV-B24R	B24R	Long Glade Run	Rockingham Co.	POTO/SHEN	10.7		Miles	SWIM		FC	NPS	2002
VAV-B25R	B25R	Cooks Creek	Rockingham Co., Dayton, Mt. Crawford	POTO/SHEN	13.32		Miles	SWIM	ALUS	FC**/BC	NPS	2002

VAV-B26R	B26R	Blacks Run	Rockingham Co., City of Harrisonburg	POTO/SHEN	10.74	Miles	SWIM	ALUS	FC**/BC	NPS	2002
VAV-B28R	B28R	Naked Creek	Augusta Co.	POTO/SHEN	6.75	Miles	SWIM		FC	NPS	2002
VAV-B45R	B45R	Holmans Creek	Rockingham Co., Shenandoah Co.	POTO/SHEN	10.44	Miles	SWIM	ALUS	FC**/BC	NPS	2002
VAV-B47R	B47R	Lacey Spring	Rockingham Co.	POTO/SHEN	0.2	Miles	ALUS		BC	PS	2002
VAV-B52R	B52R	Orndorff Spring Branch	Shenandoah Co.	POTO/SHEN	0.15	Miles	ALUS		BC	PS	2002
VAV-H09R	H09R	Montebello Spring Branch	Nelson Co.	JAMES	0.02	Miles	ALUS		BC	PS	2002
VAV-H28R	H28R	Moore's Creek	Albemarle Co., Charlottesville	JAMES	6.37	Miles	SWIM		FC	NPS	2002
VAV-I14R	I14R	Coursey Springs Branch	Bath Co.	JAMES	0.02	Miles	ALUS		BC	PS	2002
VAV-I32R	I32R	Castaline Spring Branch	Augusta Co.	JAMES	0.8	Miles	ALUS		BC	PS	2002
VAW-L09R	L09R	Maggodee Creek	Franklin	ROANOKE	21.13	Miles	SWIM		FC	NPS	2002
VAW-L10R	L10R	Blackwater River	Franklin	ROANOKE	20	Miles	SWIM		FC	NPS	2002
VAW-L11R	L11R	Gills Creek	Franklin	ROANOKE	27.97	Miles	SWIM		FC	NPS	2002
VAW-N20R	N20R	Dodd Creek	Floyd	NEW	2.62	Miles	SWIM		FC	NPS	2002
VAW-N21R	N21R	Mill Creek	Montgomery	NEW	5.68	Miles	SWIM		FC	NPS	2002
VAN-A08R	A08R	Little River	Loudoun	POTO/SHEN	6.25	Miles	SWIM		FC	UNK	2004
VAN-A17R	A17R	Licking Run	Fauquier	POTO/SHEN	6.24	Miles	SWIM		FC	UNK	2004
VAN-E02R	E02R	Carter Run	Fauquier	RAPPAHANNOCK	2.67	Miles	SWIM		FC	UNK	2004
VAN-E02R	E02R	Great Run	Fauquier	RAPPAHANNOCK	2.7	Miles	SWIM		FC	UNK	2004
VAN-E07R	E07R	Muddy Run	Culpeper	RAPPAHANNOCK	5.97	Miles	SWIM		FC	UNK	2004
VAN-E08R	E08R	Marsh Run	Fauquier	RAPPAHANNOCK	8.35	Miles	SWIM		FC	UNK	2004
VAN-E10R	E10R	Alcotti Run	Stafford	RAPPAHANNOCK	1.94	Miles	SWIM		FC	UNK	2004
VAN-E10R	E10R	Deep Run	Stafford, Fauquier	RAPPAHANNOCK	4.75	Miles	SWIM		FC	UNK	2004
VAN-E15R	E15R	Little Dark Run	Madison	RAPPAHANNOCK	4.35	Miles	SWIM		FC	UNK	2004
VAN-E20R	E20R	Claiborne Run	Stafford	RAPPAHANNOCK	5.19	Miles	SWIM		FC	UNK	2004
VAP-E23R	E23R	Cat Point Creek	Richmond Co.	RAPPAHANNOCK	3.1	Miles	ALUS		pH	UNK	2004
VAP-E23R	E23R	Mount Landing Creek	Essex	RAPPAHANNOCK	3.82	Miles	ALUS		pH	UNK	2004
VAP-E23R	E23R	Pisacataway Creek	Essex	RAPPAHANNOCK	2.3	Miles	ALUS		pH	UNK	2004
VAN-F07R	F07R	Plentiful Creek	Spotsylvania	YORK	4.94	Miles	SWIM		FC	UNK	2004
VAP-F12R	F12R	Mechumps Creek	Hanover	YORK	5.6	Miles	ALUS	SWIM	pH/FC	UNK	2004
VAP-F13R	F13R	Matadequin Creek	Hanover	YORK	5.1	Miles	ALUS	SWIM	pH/FC	UNK	2004
VAP-G02R	G02R	Fourmile Creek	Henrico	JAMES	3.2	Miles	ALUS	SWIM	pH/FC	UNK/Natural	2004
VAP-G06R	G06R	White Oak Swamp	Henrico	JAMES	6.7	Miles	ALUS	SWIM	pH/FC	UNK	2004
VAP-H39R	H39R	Tuckahoe Creek	Henrico,	JAMES	4.69	Miles	ALUS	SWIM	DO/FC	UNK	2004

Goochland											
VAP-J12R	J12R	Winterpock Creek	Chesterfield	JAMES	10.5	Miles	ALUS	ALUS	pH/DO	UNK	2004
VAP-J12R	J12R	Winticomack Creek	Amelia	JAMES	4.1	Miles	ALUS		pH/DO	UNK	2004
VAS-O07R	O07R	Beaver Creek	Washington, City of Bristol	TENNESSEE/BS	20.73	Miles	SWIM	ALUS	FC/BC	NPS	2004
VAS-O09R	O09R	North Fork Holston River	Smyth	TENNESSEE/BS	5.69	Miles	ALUS		BC	NPS	2004
VAS-P03R	P03R	Middle Creek	Tazewell	TENNESSEE/BS	10.7	Miles	ALUS		BC	MINE	2004
VAS-P11R	P11R	Guest River	Wise	TENNESSEE/BS	28.33	Miles	ALUS		BC	MINE	2004
VAS-P20R	P20R	Straight Creek	Lee	TENNESSEE/BS	7.1	Miles	SWIM		FC	NPS	2004
VAS-P20R	P20R	North Fork Powell River	Lee	TENNESSEE/BS	3.94	Miles	ALUS		BC	NPS	2004
VAT-C10E	C10E	Holdens Creek	Accomack	BAY/COASTAL		0.16 Sq. Mi.	SWIM		FC	UNK	2004
VAT-C10R	C10R	Sandy Bottom Branch	Accomack	BAY/COASTAL	1.5	Miles	SWIM	ALUS	FC/BC	UNK	2004
VAT-C10R	C10R	Unnamed Tributary to Sandy Bottom Branch	Accomack	BAY/COASTAL	0.3	Miles	SWIM	ALUS	FC/BC	UNK	2004
VAT-D02R	D02R	Petit Branch	Accomack	BAY/COASTAL	1	Miles	SWIM		FC	UNK	2004
VAT-D02R	D02R	Petit Branch	Accomack	BAY/COASTAL	1.25	Miles	ALUS		NH3	UNK	2004
VAT-D03R	D03R	Parker Creek	Accomack	BAY/COASTAL	1.51	Miles	ALUS	SWIM	BC/FC	UNK	2004
VAV-B12R	B12R	Lewis Creek	Augusta Co., City of Staunton	POTO/SHEN	12.06	Miles	SWIM	ALUS	FC/BC	NPS	2004
VAV-B13R	B13R	Moffett Creek	Augusta Co.	POTO/SHEN	8.73	Miles	SWIM	ALUS	FC/BC	NPS	2004
VAV-B15R	B15R	Polecat Draft	Augusta Co.	POTO/SHEN	7.28	Miles	SWIM		FC	NPS	2004
VAV-B22R	B22R	Muddy Creek	Rockingham Co.	POTO/SHEN	10.36	Miles	SWIM	ALUS	FC**/BC	NPS	2004
VAV-B27R	B27R	Pleasant Run	Rockingham Co.	POTO/SHEN	6.3	Miles	SWIM	ALUS	FC**/BC	NPS	2004
VAV-B29R	B29R	Mill Creek	Rockingham Co.	POTO/SHEN	2.66	Miles	SWIM	ALUS	FC**/BC	NPS	2004
VAV-B47R	B47R	Smith Creek	Rockingham Co., Shenandoah Co.	POTO/SHEN	25.82	Miles	ALUS		BC	NPS	2004
VAV-F06R	F06R	Mountain Run	Orange	YORK	2.6	Miles	SWIM		FC	NPS	2004
VAW-L02R	L02R	Wilson Creek	Montgomery	ROANOKE	5	Miles	SWIM		FC	NPS	2004
VAW-L14R	L14R	Pigg River	Franklin	ROANOKE	20	Miles	SWIM		FC	NPS	2004
VAW-L14R	L14R	Storey Creek	Franklin	ROANOKE	11.66	Miles	SWIM		FC	NPS	2004
VAW-L18R	L18R	Pigg River	Pittsylvania	ROANOKE	14.31	Miles	SWIM		FC	NPS	2004
VAW-L42R	L42R	Dan River	Patrick	ROANOKE	10.16	Miles	SWIM		FC	NPS	2004
VAW-L45R	L45R	South Mayo River	Patrick	ROANOKE	6.52	Miles	SWIM		FC	NPS	2004
VAN-A01R	A01R	Piney Run	Loudoun	POTO/SHEN	3.87	Miles	SWIM		FC	UNK	2006
VAN-A05R	A05R	Cromwells Run	Loudoun, Fauquier	POTO/SHEN	3.81	Miles	SWIM		FC	UNK	2006
VAN-A06R	A06R	North Fork Goose Creek	Loudoun	POTO/SHEN	4.5	Miles	SWIM		FC	UNK	2006
VAN-A07R	A07R	Beaverdam Creek	Loudoun	POTO/SHEN	6.43	Miles	SWIM		FC	UNK	2006

VAN-A08R	A08R	Sycolin Creek	Loudoun	POTO/SHEN	6.83	Miles	SWIM	FC	UNK	2006
VAN-A12E	A12E	Four Mile Run	Arlington County,	POTO/SHEN		0.25 Sq. Mi.	SWIM	FC	UNK	2006
VAN-A13E	A13E	Hunting Creek	Alexandria City	POTO/SHEN		0.48 Sq. Mi.	SWIM	FC	UNK	2006
VAN-A17R	A17R	Cedar Run	Fauquier, Prince William	POTO/SHEN	27.68	Miles	SWIM	FC	UNK	2006
VAN-F07R	F07R	Pamunkey Creek	Orange	YORK	5.29	Miles	SWIM	FC	UNK	2006
VAN-F07R	F07R	Terry's Run	Orange	YORK	5.35	Miles	SWIM	FC	UNK	2006
VAP-G01R	G01R	Almond Creek	Richmond City	JAMES	3.3	Miles	SWIM	FC	UNK/NPS	2006
VAP-G05R	G05R	Chickahominy River, UT	Hanover	JAMES	1.2	Miles	ALUS	BC	UNK	2006
VAP-G05R	G05R	Upham Brook	Henrico	JAMES	5.83	Miles	SWIM	FC	NPS	2006
VAP-J06R	J06R	Saylers Creek	Prince Edward	JAMES	8.9	Miles	SWIM	FC	NPS	2006
VAP-J11R	J11R	Deep Creek, UT -	Nottoway, Crewe	JAMES	2.16	Miles	ALUS	BC	PS	2006
VAP-K07R	K07R	Roses Creek	Brunswick, Alberta	CHOWAN	3.15	Miles	ALUS	SWIM BC/FC	NPS/PS	2006
VAP-K07R	K07R	Roses Creek	Brunswick, Alberta, Lawrenceville	CHOWAN	6.68	Miles	SWIM	FC	UNK	2006
VAP-K16R	K16R	Hurricane Branch, UT	Nottoway, Blackstone	CHOWAN	1.12	Miles	ALUS	BC	PS	2006
VAP-L39R	L39R	Twittys Creek	Charlotte	ROANOKE	7.24	Miles	ALUS	BC	PS	2006
VAP-L39R	L39R	Ash Camp Creek	Charlotte	ROANOKE	2.6	Miles	ALUS	BC	PS	2006
VAP-L78R	L78R	Roanoke River	Mecklenburg	ROANOKE	9.46	Miles	ALUS	DO	PS/Dam Release	2006
VAS-N06R	N06R	Chestnut Creek	Carroll, Grayson, Galax	NEW	15	Miles	ALUS	BC	MINE/NPS	2006
VAS-N31R	N31R	Hunting Camp Creek	Bland	NEW	6.29	Miles	ALUS	BC	UNK	2006
VAS-O10R	O10R	North Fork Holston	Smyth , Washington, Scott	TENNESSEE/BS	80.4	Miles	FISH	VDH(Hg)	PS	2006
VAS-O11R	O11R	North Fork Holston River	Washington	TENNESSEE/BS	5.34	Miles	ALUS	BC	NPS	2006
VAS-O13R	O13R	North Fork Holston River	Scott County	TENNESSEE/BS	5.2	Miles	SWIM	FC	NPS	2006
VAS-P08R	P08R	Dumps Creek	Russell	TENNESSEE/BS	3.4	Miles	ALUS	BC	MINE	2006
VAS-P13R	P13R	Stock Creek	Scott	TENNESSEE/BS	0.7	Miles	ALUS	BC	NPS	2006
VAS-P17R	P17R	Callahan Creek	Wise	TENNESSEE/BS	1.58	Miles	ALUS	BC	MINE/NPS	2006
VAS-P17R	P17R	Powell River	Wise	TENNESSEE/BS	3.3	Miles	SWIM	FC	NPS	2006
VAS-Q03R	Q03R	PawPaw Creek	Buchanan	TENNESSEE/BS	4.52	Miles	ALUS	BC	MINE	2006
VAS-Q03R	Q03R	Knox Creek	Buchanan	TENNESSEE/BS	18	Miles	ALUS	BC	MINE/NPS	2006
VAS-Q04R	Q04R	Garden Creek	Buchanan	TENNESSEE/BS	1.87	Miles	ALUS	BC	MINE/NPS	2006
VAT-C07E	C07E	Brick Kiln Creek	Newport News	BAY/COASTAL		0.07 Sq. Mi.	SWIM	FC	UNK	2006
VAT-C07E	C07E	New Market Creek	Hampton	BAY/COASTAL		0.05 Sq. Mi.	SWIM	FC	UNK	2006
VAT-C07E	C07E	Poquoson River	York	BAY/COASTAL		0.52 Sq. Mi.	SWIM	FC	UNK	2006

VAT-C08E	C08E	London Bridge Creek	Virginia Beach	BAY/COASTAL		0.05 Sq. Mi.	SWIM	FC	UNK	2006	
VAT-C08E	C08E	Thalia Creek	Virginia Beach	BAY/COASTAL		0.16 Sq. Mi.	SWIM	FC	UNK	2006	
VAT-G10E	G10E	Powhatan Creek	James City	JAMES		0.26 Sq. Mi.	SWIM	FC	UNK	2006	
VAT-K41R	K41R	West Neck Creek	Virginia Beach	CHOWAN	1	Miles	SWIM	FC	UNK	2006	
VAT-K42E	K42E	Nawney Creek	Virginia Beach	CHOWAN		0.12 Sq. Mi.	SWIM	FC	UNK	2006	
VAV-B08R	B08R	Opequon Creek	Frederick Co.	POTO/SHEN	22.44	Miles	SWIM	FC	NPS	2006	
VAV-B09R	B09R	Opequon Creek	Frederick Co.	POTO/SHEN	8.73	Miles	ALUS	BC	NPS	2006	
VAV-B09R	B09R	Abrams Creek	Frederick Co., City of Winchester	POTO/SHEN	10.38	Miles	ALUS	SWIM	BC/FC	NPS/CSO	2006
VAV-B10R	B10R	Middle River	Augusta Co.	POTO/SHEN	24.1	Miles	SWIM	FC	NPS	2006	
VAV-B15R	B15R	Middle River	Augusta Co.	POTO/SHEN	18.12	Miles	SWIM	FC	NPS	2006	
VAV-B39R	B39R	Hawksbill Creek	Page Co., Town of Luray	POTO/SHEN	9.4	Miles	SWIM	FC	NPS/CSO	2006	
VAV-B46R	B46R	Linville Creek	Rockingham Co., Broadway	POTO/SHEN	13.55	Miles	SWIM	ALUS	FC/BC	NPS	2006
VAW-L08R	L08R	North Fork of the Blackwater River	Franklin	ROANOKE	11.48	Miles	SWIM	ALUS	FC**/BC	NPS	2006
VAW-L08R	L08R	Blackwater River	Franklin	ROANOKE	9.83	Miles	SWIM	ALUS	FC**/BC	NPS	2006
VAW-L08R	L08R	Blackwater River	Franklin	ROANOKE	15.78	Miles	SWIM	ALUS	FC**/BC	NPS	2006
VAW-L34R	L34R	Falling River	Campbell	ROANOKE	7.61	Miles	SWIM	FC	NPS	2006	
VAW-L61R	L61R	Fall Creek	Danville City	ROANOKE	12.18	Miles	SWIM	FC	NPS	2006	
VAW-L66R	L66R	Cherrystone Creek	Pittsylvania, Chatham Town	ROANOKE	13.96	Miles	SWIM	FC	NPS	2006	
VAW-N16R	N16R	New River	Wythe/Pulaski	NEW	2.13	Miles	ALUS	BC	UNK	2006	
VAW-N17R	N17R	Peak Creek	Pulaski	NEW	4.65	Miles	ALUS	BC	NPS	2006	
VAW-N18R	N18R	Crab Creek	Montgomery	NEW	10.46	Miles	SWIM	ALUS	FC/BC	NPS	2006
VAW-N22R	N22R	Stroubles Creek	Montgomery	NEW	4.87	Miles	ALUS	BC	NPS	2006	
VAW-N22R	N22R	Back Creek	Pulaski	NEW	17.38	Miles	SWIM	FC	NPS	2006	
VAN-A08R	A08R	Goose Creek	Loudoun	POTO/SHEN	8.66	Miles	ALUS	BC	UNK	2008	
VAN-A11R	A11R	Difficult Run	Fairfax	POTO/SHEN	3.24	Miles	ALUS	BC	UNK	2008	
VAN-A15R	A15R	Accotink Creek	Fairfax	POTO/SHEN	10.18	Miles	ALUS	BC	UNK	2008	
VAN-A19R	A19R	South Run	Fauquier, Prince William	POTO/SHEN	2.42	Miles	ALUS	BC	UNK	2008	
VAN-A23R	A23R	Bull Run	Prince William, Fairfax (Boundary Line), Manassas Park	POTO/SHEN	15.64	Miles	ALUS	BC	UNK	2008	
VAP-E23E	E23E	Hoskins Creek	Essex	RAPPAHANNOCK		0.06 Sq. Mi.	SWIM	FC	UNK/PS	2008	
VAP-G01E	G01E	James River	Richmond City, Henrico,	JAMES		10.84 Sq. Mi.	SWIM	FC	NPS/CSO	2008	

VAP-G03E	G03E	Bailey Bay, Bailey Creek (tidal)	Chesterfield Hopewell City	JAMES		0.5 Sq. Mi.	ALUS	SWIM	BC/DO/FC	UNK/PS	2008
VAP-G03R	G03R	Bailey Creek	Hopewell City	JAMES	7.8	Miles	ALUS	SWIM	DO/FC	UNK	2008
VAP-G08R	G08R	Morris Creek	Charles City	JAMES	7.73	Miles	ALUS	SWIM	DO,pH/FC	UNK	2008
VAP-H33R	H33R	Deep Creek	Powhatan	JAMES	11.2	Miles	ALUS		DO	UNK	2008
VAP-H39R	H39R	James River	Henrico, Chesterfield, Richmond City	JAMES	3.2	Miles	SWIM	ALUS	FC/BC	NPS/CSO	2008
VAP-J01R	J01R	Appomattox River	Appomattox, Buckingham, Prince Edward, Cumberland, Amelia, Powhatan, Chesterfield	JAMES	77.3	Miles	SWIM		FC	NPS	2008
VAP-J08R	J08R	Flat Creek	Amelia	JAMES	4.1	Miles	SWIM		FC	PS/NPS	2008
VAP-J15E	J15E	Appomattox River	Hopewell City, Prince George, Chesterfield	JAMES		2.68 Sq. Mi.	SWIM		FC	NPS	2008
VAP-K32R	K32R	Spring Branch	Sussex, Waverly	CHOWAN	2.7	Miles	ALUS		BC	UNK/PS	2008
VAP-L79R	L79R	Flat Creek	Mecklenburg, South Hill	ROANOKE	8.95	Miles	ALUS	SWIM	BC/FC	PS	2008
VAS-N02R	N02R	New River	Grayson	NEW	0.6	Miles	ALUS		BC	UNK	2008
VAS-N36R	N36R	Bluestone River	Tazewell	NEW	6.62	Miles	SWIM		FC	NPS	2008
VAS-N37R	N37R	Laurel Fork	Tazewell	NEW	2.84	Miles	ALUS	SWIM	DO/FC/BC	NPS	2008
VAS-P01R	P01R	Clinch River	Tazewell	TENNESSEE/BS	5.34	Miles	ALUS		BC	NPS	2008
VAS-P04R	P04R	Lewis Creek	Russell	TENNESSEE/BS	4.63	Miles	ALUS		BC	NPS	2008
VAS-P10R	P10R	Lick Creek, Laurel Br, Straight Hol., Rt.Fk., Cigarette Hol.	Russell	TENNESSEE/BS	15.41	Miles	ALUS	SWIM	BC/FC	NPS	2008
VAS-P21R	P21R	East and West Batie Creek	Lee	TENNESSEE/BS	0.74	Miles	ALUS		DO	NPS	2008
VAS-Q08R	Q08R	Bull Creek	Buchanan	TENNESSEE/BS	13	Miles	ALUS		BC	MINE	2008
VAS-Q11R	Q11R	McClure River	Dickenson	TENNESSEE/BS	14.25	Miles	SWIM		FC	NPS	2008
VAS-Q13R	Q13R	North Fork Pound River	Wise	TENNESSEE/BS	1.08	Miles	ALUS		BC	NPS	2008
VAS-Q13R	Q13R	South Fork Pound River	Wise	TENNESSEE/BS	3.48	Miles	ALUS		BC	MINE	2008
VAT-G11E	G11E	Pagan River	Town of Smithfield	JAMES		1.5 Sq. Mi.	SWIM		FC	PS	2008
VAT-G13E	G12E	Nansemond River	Suffolk	JAMES		0.22 Sq. Mi.	SWIM		FC	UNK	2008
VAT-G13E	G12E	Shingle Creek	Suffolk	JAMES		0.1 Sq. Mi.	SWIM		FC	UNK	2008
VAT-G15E-01	G15E-01	Southern Branch - Elizabeth R	Chesapeake, Portsmouth	JAMES		3 Sq. Mi.	ALUS		TBT	Port activities	2008
VAT-G15E-02	G15E-02	Broad Creek	Norfolk	JAMES		0.35 Sq. Mi.	SWIM		FC	UNK	2008
VAT-G15E-02	G15E-	Eastern Branch - Elizabeth R	Norfolk	JAMES		0.6 Sq. Mi.	ALUS		TBT	Port activities	2008

02										
VAT-G15E-03	G15E-03	Elizabeth River	Norfolk, Portsmouth	JAMES	9.6	Sq. Mi.	ALUS	TBT	Port activities	2008
VAV-B02R	B02R	West Strait Creek	Highland County, Monterey	POTO/SHEN	0.35	Miles	ALUS	BC	PS	2008
VAV-B17R	B17R	North River	Rockingham Co.	POTO/SHEN	25.12	Miles	SWIM	FC	NPS	2008
VAV-B23R	B23R	North River	Rockingham Co., Augusta Co.	POTO/SHEN	16.13	Miles	ALUS	BC	UNK	2008
VAV-B30R	B30R	South River	Augusta Co.	POTO/SHEN	12.6	Miles	SWIM	FC	NPS	2008
VAV-B32R	B32R	South River	Augusta Co., City of Waynesboro	POTO/SHEN	8.93	Miles	ALUS	BC	NPS	2008
VAV-B32R	B32R	South River/S.F. Shenandoah River	Augusta Co., Rockingham Co., Page Co., Waynesboro, Towns of Elkton & Shenandoah	POTO/SHEN	103.4	Miles	FISH	VDH(Hg)	UNK	2008
VAV-B34R	B34R	Cub Run	Rockingham Co.	POTO/SHEN	13.9	Miles	SWIM	FC	NPS	2008
VAV-B35R	B35R	Quail Run	Rockingham Co.	POTO/SHEN	5.07	Miles	ALUS	BC	PS	2008
VAV-B38R	B38R	Mill Creek	Page Co.	POTO/SHEN	6.73	Miles	SWIM	FC	NPS	2008
VAV-B41R	B41R	S.F. Shenandoah River/Shenandoah River	Warren Co., Clarke Co., Front Royal, Berryville	POTO/SHEN	36.45	Miles	FISH	VDH(PCB)	PS	2008
VAV-B45R	B45R	North Fork Shenandoah River	Rockingham Co., Shenandoah Co., Broadway, Timberville, Mt. Jackson	POTO/SHEN	14.27	Miles	SWIM	FC	NPS	2008
VAV-B47R	B47R	Smith Creek	Shenandoah Co., Rockingham Co.	POTO/SHEN	34	Miles	SWIM	FC	NPS	2008
VAV-B48R	B48R	Mill Creek	Shenandoah Co.	POTO/SHEN	15.03	Miles	ALUS	BC	UNK	2008
VAV-B50R	B50R	Toms Brook	Shenandoah Co.	POTO/SHEN	7.18	Miles	ALUS	BC	UNK	2008
VAV-B51R	B51R	N.F. Shenandoah River	Town of Front Royal	POTO/SHEN	5.33	Miles	FISH	VDH(PCB)	PS	2008
VAV-B57R	B57R	Spout Run	Clarke County	POTO/SHEN	7.6	Miles	ALUS	SWIM BC/FC	NPS	2008
VAV-H16R	H16R	Rockfish River	Nelson County	JAMES	4.87	Miles	ALUS	BC	UNK	2008
VAV-I35R	I35R	Mill Creek	Rockbridge Co.	JAMES	8.6	Miles	SWIM	FC	NPS	2008
VAV-I35R	I35R	Cedar Grove Branch	Rockbridge Co.	JAMES	4.71	Miles	SWIM	FC	NPS	2008
VAW-H01R	H01R	Reed Creek	Bedford	JAMES	12	Miles	SWIM	FC	NPS	2008
VAW-H01R	H01R	James River	Bedford, Amherst	JAMES	5.71	Miles	SWIM	FC	NPS	2008
VAW-H03R	H03R	Ivy Creek	Lynchburg City	JAMES	5.42	Miles	SWIM	FC	NPS	2008
VAW-H03R	H03R	Blackwater Creek	Lynchburg City	JAMES	10.7	Miles	SWIM	FC	NPS	2008
VAW-H03R	H03R	Fishing Creek	Lynchburg City	JAMES	5	Miles	SWIM	FC	NPS	2008
VAW-H03R	H03R	James River	Lynchburg City	JAMES	20	Miles	SWIM	FC	NPS	2008

VAW-H12R	H12R	Buffalo River	Nelson Co.	JAMES	2.45	Miles	ALUS	BC	UNK	2008	
VAW-L04R	L04R	Ore Branch	Roanoke Co., Roanoke City	ROANOKE	3.9	Miles	SWIM	FC	NPS	2008	
VAW-L04R	L04R	Roanoke River	Roanoke Co., Salem City, Roanoke City,	ROANOKE	11.72	Miles	SWIM	ALUS	FC/BC	NPS	2008
VAW-L05R	L05R	Lick Run	Roanoke City	ROANOKE	3.5	Miles	SWIM	FC	NPS	2008	
VAW-L05R	L05R	Glade Creek	Roanoke, Botetourt, Vinton Town	ROANOKE	5.75	Miles	SWIM	FC	NPS	2008	
VAW-L05R	L05R	Tinker Creek	Roanoke, Botetourt, Vinton Town	ROANOKE	19.06	Miles	SWIM	FC	NPS	2008	
VAW-L05R	L07R	Roanoke River	Bedford, Franklin	ROANOKE	6.26	Miles	SWIM	FC	NPS	2008	
VAW-L54R	L54R	Smith River	Henry	ROANOKE	15	Miles	ALUS	BC	PS/NPS	2008	
VAP-A31E	A31E	Mattox Creek	Westmoreland	POTO/SHEN		0.3 Sq. Mi.	SWIM	FC	UNK	2010	
VAP-F04R	F04R	South Anna River	Hanover	YORK	4.83	Miles	SWIM	FC	UNK	2010	
VAP-F13E	F13E	Pamunkey River	New Kent, King William	YORK		1.35 Sq. Mi.	SWIM	FC	UNK	2010	
VAP-L40R	L40R	Roanoke River	Charlotte, Halifax	ROANOKE	18.24	Miles	SWIM	FC	UNK	2010	
VAP-L41R	L41R	Difficult Creek	Halifax	ROANOKE	5.8	Miles	SWIM	FC	UNK	2010	
VAP-L62R	L62R	Dan River	Halifax, Mecklenburg	ROANOKE	42.8	Miles	SWIM	FC	UNK	2010	
VAP-L63R	L63R	Birch Creek	Pittsylvania, Halifax	ROANOKE	4.6	Miles	SWIM	FC	UNK	2010	
VAP-L67R	L67R	Banister River	Pittsylvania, Halifax	ROANOKE	10.8	Miles	SWIM	FC	UNK	2010	
VAP-L71R	L71R	Banister River	Halifax	ROANOKE	12.26	Miles	SWIM	FC	UNK	2010	
VAS-Q04R	Q04R	Levisa Fork	Buchanan	TENNESSEE/BS	4.1	Miles	ALUS	BC	MINE/NPS	2010	
VAS-Q07R	Q07R	Slate Creek	Buchanan	TENNESSEE/BS	4.8	Miles	ALUS	BC	NPS	2010	
VAS-Q08R	Q08R	Levisa Fork	Buchanan	TENNESSEE/BS	1.52	Miles	ALUS	BC	MINE	2010	
VAS-Q12R	Q12R	Russell Prater Creek	Dickenson	TENNESSEE/BS	11.4	Miles	ALUS	BC	MINE	2010	
VAV-B33R	B33R	South Fork Shenandoah River	Rockingham Co.	POTO/SHEN	7.64	Miles	ALUS	BC	UNK	2010	
VAV-B36R	B36R	Naked Creek	Rockingham Co., Page	POTO/SHEN	6.65	Miles	ALUS	BC	UNK	2010	
VAV-B38R	B38R	South Fork Shenandoah River	Page Co.	POTO/SHEN	15.69	Miles	ALUS	BC	UNK	2010	
VAV-H26R	H26R	S.F. Rivanna River	Albemarle Co., Charlottesville	JAMES	3.58	Miles	SWIM	FC	UNK	2010	
VAV-H27R	H27R	N.F. Rivanna River	Albemarle Co.	JAMES	6.35	Miles	ALUS	BC	UNK	2010	
VAV-H28R	H28R	Rivanna River	Albemarle Co., Fluvanna Co.	JAMES	13.27	Miles	ALUS	BC	NPS	2010	
VAV-H29R	H29R	Rivanna River	Albemarle Co., Fluvanna Co.	JAMES	13.13	Miles	SWIM	FC	NPS	2010	

VAV-I32R	I32R	Little Calfpasture River	Rockbridge Co.	JAMES	1	Miles	ALUS	BC	NPS	2010	
VAV-I33R	I33R	Kerrs Creek	Rockbridge Co	JAMES	11.49	Miles	ALUS	BC	NPS	2010	
VAV-I34R	I34R	Hays/Moffatts Creeks	Rockbridge Co., Augusta Co	JAMES	19.15	Miles	SWIM	FC	NPS	2010	
VAW-I09R	I04R	Jackson River	Alleghany Co., Covington	JAMES	0.55	Miles	SWIM	ALUS	FC/BC/DO	NPS/PS	2010
VAW-I09R	I09R	Jackson River	Alleghany Co., Covington, Clifton Forge City	JAMES	24.09	Miles	SWIM	ALUS	FC/BC/DO	NPS/PS	2010
VAW-I18R	I18R	James River	Botetourt	JAMES	10.94	Miles	ALUS	BC	PS	2010	
VAW-I24R	I24R	James River	Botetourt	JAMES	9.26	Miles	ALUS	BC	PS	2010	
VAW-I26R	I26R	Looney Mill Creek	Botetourt	JAMES	2.96	Miles	SWIM	FC	NPS	2010	
VAW-L30R	L30R	Roanoke River	Campbell, Pittsylvania, Halifax	ROANOKE	8.34	Miles	SWIM	FC	NPS	2010	
VAW-L30R	L30R	Roanoke River	Campbell, Pittsylvania, Halifax, Charlotte	ROANOKE	55.79	Miles	FISH	VDH(PCB)	UNK	2010	

* Requesting EPA Approval for De-listing
**Fecal Coliform component under contract

Key:
DW=Drinking Water
BC=Benthic Community
FC=Fecal Coliform
DO=Dissolved Oxygen
pH=Acidity/Alkalinity
Hg=Mercury
VDH=Virginia Department of Health
PCB=Polychlorinated biphenyls
ALUS=Aquatic Life Use Support
FISH=Fishing Use Support
SWIM=Swimming Use Support
TBT=Tributyltin
PS=Point Source
NPS=Nonpoint Source
UNK=Unknown
CSO=Combined Sewer Overflow

Appendix D

Tracking Worksheet for 1999 – 2002 TMDLs

**VIRGINIA'S TMDL
STATUS REPORT**

**Revised:
September 13, 2000**

Legend: F.C. Fecal Coliform
B. Benthic Impairment

												DUE to EPA				
Watershed ID	Stream Name	City/County	Impaired Miles	Impairment	Contract Date	Date 1st.	Date 1st.	Date 2nd.	Date 2nd.	Date 3rd.	Date 3rd.	Sub. To	EPA	SWCB	Comments	
					Contractor	Pub.Not	Pub.Mtg	Pub.Not.	Pub.Mtg	Pub.Not	Pub.Mtg	EPA	Approv	Approv.		
Potomac & Shenandoah River Basin																
VAV-B22R Muddy Creek	Rockingham Co.	10.36	F.C.	EPA	9/14/98	9/16/98	n/a	10/26/98	12/7/98	12/15/98	5/1/00	9/1/99		TMDL being revised by UVA-est. 8/2000 comp.		
			B.	Tetra TECH, Inc.								6/29/99				
VAV-B21R Muddy Creek	Rockingham Co.	7.04	Nitrate	15-Nov-98	11/22/99	12/8/99	2/28/00	3/14/00	na	na	4/1/00	4/27/00				
				UVA(DEQ)							3/31/00					
VAV-B21R Dry River	Rockingham Co.	6.47	F.C.	2-Sep-99	12/6/99	12/9/99	12/28/99	1/20/00	3/13/00	3/28/00	5/1/00					
				VA TECH(DCR)							5/1/00					
VAV-B27R Pleasant Run	Rockingham Co.	6.30	F.C.	2-Sep-99	12/6/99	12/9/99	12/28/99	1/20/00	3/13/00	3/28/00	5/1/00					
			B.	VA TECH(DCR)							5/1/00					
VAV-B29R Mill Creek	Rockingham Co.	2.66	F.C.	2-Sep-99	12/6/99	12/9/99	12/28/99	1/20/00	3/13/00	3/28/00	5/1/00					
			B.	VA TECH(DCR)							5/1/00					
VAV-B10R Cockran Spring	Augusta Co.	0.80	B.	May-00							4/1/02					
				VWRRC(DEQ)												
VAV-B14R Christians Creek	Augusta Co.	31.52	F.C.	15-Jun-99	4/24/00	5/4/00	10/23/00	11/8/00			5/1/02					
				USGS(DCR)												

			B.											
VAV-B26R Blacks Run	Rockingham Co.	10.74	F.C.	15-Jun-99 USGS(DCR)	8/14/00	8/30/00					5/1/02			
			B.	EPA Tetra Tech, Inc.							5/1/02			
VAN-A15R Accotink Creek	Fairfax Co.	4.50	F.C.	15-Jun-99 USGS(DCR)	10/11/99	10/28/99	1/31/00	3/1/00			5/1/02			
VAV-B19R Mossy Creek	Rockingham & Augusta Co.	10.14	F.C.	(DCR)							5/1/02			
VAV-B24R Long Glade	Rockingham & Augusta Co.	10.70	F.C.	(DCR)							5/1/02			
VAV-B25R Cooks Creek	Rockingham Co.	13.32	F.C.	EPA Tetra Tech, Inc.							5/1/02			
			B.	EPA Tetra Tech, Inc.							5/1/02			
VAV-B28R Naked Creek	Augusta Co.	6.75	F.C.	(DCR)							5/1/02			
VAV-B45R Holmans Creek	Rockingham & Shenandoah Co.s	10.44	F.C.	SAIC(DCR)	3/27/00	4/12/00	7/17/00	7/27/00			5/1/02			
			B.											
VAV-B47R Lacey Spring	Rockingham Co.	0.20	B.	May-00 VWRRC(DEQ)							4/1/02			
VAV-B52R Orndorff Spring Branch	Shenandoah Co.	0.15	B.	May-00 VWRRC(DEQ)							4/1/02			
VAN-A02R Catocin Creek	Loudoun Co.	7.40	F.C.	(DCR)							5/1/02			
VAN-A02R North Fork Catocin Ck.	Loudoun Co.	10.53	F.C.	(DCR)							5/1/02			
VAN-A02R South Fork Catocin Ck.	Loudoun Co.	6.01	F.C.	(DCR)							5/1/02			
VAN-A12R Four Mile Run	Arlington Co.	8.00	F.C.	(DCR)							5/1/02			
VAV-H28R Moores Creek	Albemarle Co.	6.37	F.C.	(DEQ)							5/1/02			

Rappahannock River Basin

VAN-E01R Thumb Run	Fauquier Co.	7.41	F.C.	(DCR)							5/1/02			
VAN-E09R Mountain Run	Culpeper	7.58	F.C.	VA TECH(DCR)	5/24/99	6/2/99	9/13/99	9/27/99	4/24/00	5/10/00				Public comment period extended through
			B.											Sept. 13,2999

York River Basin**Chesapeake Bay Coastal****James River Basin**

VAV-I14R Coursey Springs Bran.	Bath Co.	0.02	B.	May-00 VWRRC(DEQ)							4/1/02			
VAV-I32R Castaline Spring Bran.	Augusta Co.	0.80	B.	May-00 VWRRC(DEQ)							4/1/02			
VAV-H09R Montebello Spring Bran.		0.02	B.	May-00 VWRRC(DEQ)							4/1/02			
VAV-H36R Wills River	Cumberland Co.	14.30	F.C.								5/1/02			

Roanoke River Basin

VAW-L11R Gills Creek	Franklin Co.	27.97	F.C.	(DCR)							5/1/02			
VAW-L08R Blackwater River	Franklin Co.	9.83	F.C.	Map TECH(DCR)	10/25/99	11/4/99	2/14/00	2/16/00	2/28/00	3/15/00	5/1/00			
			B.								5/2/00			
VAW-L08R Blackwater River	Franklin Co.	15.78	F.C.	Map TECH(DCR)	10/25/99	11/4/99	2/14/00	2/16/00	2/28/00	3/15/00	5/1/00			
											5/2/00			

				B.											
VAW-L08R	NF Blackwater	Franklin Co.	11.48	F.C.	Map TECH(DCR)	10/25/99	11/4/99	2/14/00	2/16/00	2/28/00	3/15/00	5/1/00 5/2/00			
				B.											
VAW-L08R	SF Blackwater	Franklin Co.	6.05	F.C.	Map TECH(DCR)	10/25/99	11/4/99	2/14/00	2/16/00	2/28/00	3/15/00	5/1/00 5/2/00			
VAW-L09R	Maggodee Creek	Franklin Co.	21.13	F.C.	Map TECH(DCR)	6/5/00	6/22/00					8/1/00			
VAW-L10R	Blackwater River	Franklin Co.	20.00	F.C.	Map TECH(DCR)	6/5/00	6/22/00					8/1/00			
VAW-L23R	Sheeps Creek	Bedford Co.	7.33	F.C.	VA TECH(DCR)	2/28/00	3/16/00	5/8/00	5/23/00	7/17/00	8/2/00	12/1/00			
VAW-L25R	Elk Creek	Bedford Co.	7.48	F.C.	VA TECH(DCR)	2/28/00	3/16/00	5/8/00	5/23/00	7/17/00	8/2/00	12/1/00			
VAW-L26R	Little Otter Creek	Bedford Co.	27.22	F.C.	VA TECH(DCR)	2/28/00	3/16/00	5/8/00	5/23/00	7/17/00	8/2/00	12/1/00			
VAW-L26R	Machine Creek	Bedford Co.	20.00	F.C.	VA TECH(DCR)	2/28/00	3/16/00	5/8/00	5/23/00	7/17/00	8/2/00	12/1/00			
VAW-L28R	Big Otter River	Campbell Co.	14.75	F.C.	VA TECH(DCR)	2/28/00	3/16/00	5/8/00	5/23/00	7/17/00	8/2/00	12/1/00			
Chowan River Basin															
New River Basin															
VAW-N20R	Dodd Creek	Floyd Co.	2.62	F.C.	(DCR)							5/1/02			

VAW-N21R	Mill Creek	Montgomery Co.	5.68	F.C.	(DCR)							5/1/02			
Holston River Basin															
VAS-O07R	Little Creek	Washington Co.	5.52	F.C.	(DCR)							5/1/02			
VAS-0o5R	Byers Creek	Washington Co.	1.19	F.C.	CH2M Hill(DCR)	11/8/99	11/9/99	12/28/99	1/27/00	3/13/00	3/30/00	5/1/00	5/1/00		
				B.											
VAS-0o5R	Cedar Creek	Washington Co.	5.24	F.C.	CH2M Hill(DCR)	11/8/99	11/9/99	12/28/99	1/27/00	3/13/00	3/30/00	5/1/00	5/1/00		
				B.											
VAS-0o5R	Hall Run	Washington Co.	5.87	F.C.	CH2M Hill(DCR)	11/8/99	11/9/99	12/28/99	1/27/00	3/13/00	3/30/00	5/1/00	5/1/00		
				B.											
VAS-O05R	Hutton Run	Washington Co.	4.20	F.C.	CH2M Hill(DCR)	11/8/99	11/9/99	12/28/99	1/27/00	3/13/00	3/30/00	5/1/00	5/1/00		
				B.											
Clinch/Powell River Basin															
VAS-P11R	Guest R.- Crab,Orch,etc	Wise Co.	46.15	F.C.	DEQ-SWRO							5/1/02			
VAS-P20R	Straight Creek, etc	Lee Co.	38.10	B.	VWRC(DEQ)							5/1/02			
VAS-P17R	Black Creek, etc	Wise Co.	5.94	B.	EPA DMME										

Appendix E

Combined Resource Needs of State Agencies (DEQ, DCR, DMME)

Appendix E is a summary of the cost estimates for implementing the TMDL program. TMDL and TMDL Implementation Plan development are the 2 components of these cost estimates. Costs are calculated for each biennium, and they are based on the schedule contained in the consent decree.

1. The first column contains the task descriptions, and most tasks show a unit cost. Cost estimates for tasks without unit cost are based on bulk estimates.
2. The second column is the number of tasks or units to be completed in the biennium for TMDL development.
3. The third column contains the cost estimates for each first column task associated with TMDL development.
4. The fourth column contains the number of Implementation Plan tasks corresponding to the task descriptions and unit costs in the first column. Since the unit cost for Implementation Plan development is different from TMDL development, the unit cost is shown in the heading of the fifth column.
5. The fifth column contains the cost estimates for each first column task associated with Implementation Plan development.
6. The sixth column contains the total costs that are the sum of third and fifth column.

The direct comparison of the number of tasks in column 2 to the TMDL schedule is difficult because some of the TMDLs have been completed without Implementation Plans, certain tasks for some TMDLs have already been funded, and EPA is directly funding TMDL development on a limited number of TMDLs:

2002 Biennium 52 TMDLs listed in Appendix C - 5 Delistings - 29 TMDLs under contract = 18 TMDLs to be done

2004 Biennium 36 Fecal Coliform TMDLs listed in Appendix C – 3 Completed TMDLs – 1 TMDL funded by EPA = 32 TMDLs to be done. 14 Benthic TMDLs listed in Appendix C – 2 TMDLs funded by EPA = 12 TMDLs to be done. Plus 19 Consent Decree TMDLs.

2006 Biennium 39 Fecal Coliform TMDLs listed in Appendix C - 3 Completed TMDLs = 36 to be done. Plus 19 Consent Decree TMDLs.

2008 Biennium Appendix C Plus 19 Consent Decree TMDLs

2010 Biennium Appendix C Plus 18 Consent Decree TMDLs and 18 EPA additions.

Also, shown in Appendix E are the number of staff and the estimated personnel costs needed for implementing the program during the 5 bienniums.

	No. Tasks	TMDL Cost	No. IPs	Impl Plan Cost \$20000/TMDL	Cost
Year 2002					
Fecal Coliform @ \$35,000/TMDL	13	455,000	28	560,000	1,015,000
Fecal Typing @ \$20,000/Segment	22	440,000			440,000
Benthics @ \$25,000/TMDL	3	75,000	8	160,000	235,000
DMME Benthics	2	224,000	2	40,000	264,000
Land Use Data @ \$20,000/Segment	11	220,000			220,000
Laboratory Costs/TMDL		236,000			236,000
Office and Field Supplies		7,500			7,500
Rent(estimated on pro rata bias)		69,750			69,750
Public Notices @ \$100/TMDL/IP	18	1,800	38	3,800	5,600
Printing TMDL Report @ \$600/TMDL/IP	18	10,800	38	22,800	33,600
Travel Cost @ \$360/TMDL/IP	18	6,480	38	13,680	20,160
Total		1,746,330		800,280	2,546,610

Year 2004					
Fecal Coliform @ \$35,000/TMDL	32	1,120,000	33	660,000	1,780,000
Fecal Typing @ \$20,000/Segment	32	640,000			640,000
Benthics @ \$25,000/TMDL	10	250,000	12	240,000	490,000
DMME Benthics	2	327,000	2	40,000	367,000
Consent Decree @ \$35,000/TMDL	19	665,000	19	380,000	1,045,000
Fecal Typing @ \$20,000/Segment	19	380,000			380,000
Other @ \$20,000/TMDL	13	260,000	13	260,000	520,000
Land Use Data @ \$20,000/Segment	61	1,220,000			1,220,000
Laboratory Costs/TMDL		434,000			434,000
Office and Field Supplies		15,000			15,000
Rent(estimated on pro rata bias)		139,500			139,500
Public Notices @ \$100/TMDL/IP	76	7,600	79	7,900	15,500
Printing TMDL Report @ \$600/TMDL/IP	76	45,600	79	47,400	93,000
Travel Cost @ \$360/TMDL/IP	76	27,360	79	28,440	55,800
Total		5,531,060		1,663,740	7,194,800

Year 2006					
Fecal Coliform @ \$35,000/TMDL	36	1,260,000	36	720,000	1,980,000
Fecal Typing @ \$20,000/Segment	36	720,000			720,000
Benthics @ \$25,000/TMDL	21	525,000	21	420,000	945,000
DMME Benthics	4	531,000	4	80,000	611,000
Consent Decree @ \$35,000/TMDL	19	665,000	19	380,000	1,045,000
Fecal Typing @ \$20,000/Segment	19	380,000			380,000
Other @ \$20,000/TMDL	2	40,000	2	40,000	80,000
Land Use Data @ \$20,000/Segment	75	1,500,000			1,500,000
Laboratory Costs/TMDL		596,000			596,000
Office and Field Supplies		15,000			15,000
Rent(estimated on pro rata bias)		139,500			139,500
Public Notices @ \$100/TMDL/IP	82	8,200	82	8,200	16,400
Printing TMDL Report @ \$600/TMDL/IP	82	49,200	82	49,200	98,400
Travel Cost @ \$360/TMDL/IP	82	29,520	82	29,520	59,040
Total		6,458,420		1,726,920	8,185,340

Year 2008					
Fecal Coliform @ \$35,000/TMDL	39	1,365,000	39	780,000	2,145,000
Fecal Typing @ \$20,000/Segment	39	780,000			780,000
Benthics @ \$25,000/TMDL	26	650,000	26	520,000	1,170,000
DMME Benthics	2	340,000	2	40,000	380,000
Consent Decree @ \$35,000/TMDL	19	665,000	19	380,000	1,045,000
Fecal Typing @ \$20,000/Segment	19	380,000			380,000
Other @ \$20,000/TMDL	13	260,000	13	260,000	520,000
Land Use Data @ \$20,000/Segment	85	1,700,000			1,700,000
Laboratory Costs/TMDL		745,000			745,000
Office and Field Supplies		15,000			15,000
Rent(estimated on pro rata bias)		139,500			139,500
Public Notices @ \$100/TMDL/IP	99	9,900	99	9,900	19,800
Printing TMDL Report @ \$600/TMDL/IP	99	59,400	99	59,400	118,800
Travel Cost @ \$360/TMDL/IP	99	35,640	99	35,640	71,280
Total		7,144,440		2,084,940	9,229,380

Year 2010					
Fecal Coliform @ \$35,000/TMDL	16	560,000	16	320,000	880,000
Fecal Typing @ \$20,000/Segment	16	320,000			320,000
Benthics @ \$25,000/TMDL	12	300,000	12	240,000	540,000
DMME Benthics	3	400,000	3	60,000	460,000
Consent Decree @ \$35,000/TMDL	18	630,000	18	360,000	990,000
Fecal Typing @ \$20,000/Segment	18	360,000			360,000
EPA Additions @ \$35,000/TMDL	18	630,000	18	360,000	990,000
Fecal Typing @ \$20,000/Segment	18	360,000			360,000
Other @ \$20,000/TMDL	3	60,000	3	60,000	120,000
Land Use Data @ \$20,000/Segment	63	1,260,000			1,260,000
Laboratory Costs/TMDL		550,000			550,000
Office and Field Supplies		15,000			15,000
Rent(estimated on pro rata bias)		139,500			139,500
Public Notices @ \$100/TMDL/IP	73	7,300	73	7,300	14,600
Printing TMDL Report @ \$600/TMDL/IP	73	43,800	73	43,800	87,600
Travel Cost @ \$360/TMDL/IP	73	26,280	73	26,280	52,560
Total		5,661,880		1,477,380	7,139,260
Grand Total		26,542,130		7,753,260	34,295,390

Personnel Cost for TMDL Development and Implementation Plans Through Year 2010 (\$)

	2001	2002	2002-2004	2004-2006	2006-2008	2008-2010	Total Cost
DEQ	150,000	1,033,000	2,054,000	2,115,000	2,179,000	1,122,000	8,653,000
DCR	330,000	825,000	3,080,000	3,740,000	4,070,000	4,070,000	16,115,000
DMME	0	0	0	0	0	0	0
TOTALS	480,000	1,858,000	5,134,000	5,855,000	6,249,000	5,192,000	24,768,000

DEQ Personnel for TMDL Development and Implementation Plans Through Year 2010

Position	Program	2001	2002	2002-2004	2004-2006	2006-2008	2008-2010
Envir. Specialist II	TMDL Development	3	7	7	7	7	7
Envir. Specialist II	WQ Mgmt. Plans		7	7	7	7	7
Envir. Specialist II	WQ Monitoring		3	3	3	3	3
Envir. Specialist II	Stream Flow Meas.		1	1	1	1	1
	Total	3	18	18	18	18	18

DCR Personnel for TMDL Development and Implementation Plans Through Year 2010

Position	Program	2001	2002	2002-2004	2004-2006	2006-2008	2008-2010
Envir. Specialist II	TMDL Development	4	4	9	10	11	11
Envir. Specialist II	TMDL Implimentation		6	10	13	14	14
	Total	4	10	19	23	25	25